

**Addendum #1**

Date: April 2, 2025 @ 11:00 AM

Project: Bethany Beach Training Site – Running Track Resurfacing and Lighting  
DEARNG Contract No. 2023-13

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The work herein shall be considered part of the bid documents for the referenced project and carried out in accordance with the following supplemental instructions issued in accordance with the Contract Documents without change in Contract Sum or Contract Time. Acknowledge receipt of addendum on the bid form as indicated.

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**General**

1. Start by indicating the project is advertised at **“Bethany Beach Training Site – Running Track Resurfacing and Lighting”** however documents provided did not include the Lighting scope. Lighting scope is included in **Addendum #1** as an alternate.

2. Project Identification:

**DEARNG Project # 2023-13**

**StudioJAED Project #23057**

**Bethany Beach Training Site – Running Track Resurfacing and Lighting**

3. Attendance at this meeting is a prerequisite for bidding on this contract.

Each individual must sign in for themselves and not for anyone that is not present. All attendees shall indicate time when signed in and signed out on the sign-in sheet.

Sealed bids for **DEARNG Contract 2023-13; ARNG 23013-BBTSTRACK– BBTS Running Track Resurfacing and Lighting** will be received by the Delaware Army National Guard by mail or at the Security Officers Desk in the Main Lobby of the Biden National Guard/Reserve Center, 1 Vavala Way, New Castle, Delaware 19720 until **1:00 PM local time on Tuesday, April 22, 2025**, at which time they will be publicly read aloud in the Multi-Purpose Room.

Sealed bids shall be mailed and addressed to the Delaware Army National Guard, 1 Vavala Way, New Castle, Delaware 19720; ATTN: Brittney M. Poore, Business Manager. The outer envelope should clearly indicate: **“DEARNG Contract 2023-13; ARNG23013-BBTSTRACK – BBTS Running Track Resurfacing and Lighting – SEALED BID – DO NOT OPEN.”**

4. The deadline for substitutions to StudioJAED is **Saturday, April 12, 2025 at 1:00 pm.**
5. The deadline for RFIs to StudioJAED is **Tuesday, April 15, 2025 at 1:00 pm.**
6. RFI and questions are to be submitted via email to Gabriel Cheung at StudioJAED.

[cheungg@studiojaed.com](mailto:cheungg@studiojaed.com)

All questions will be responded to in an Addendum.

7. Digital and hardcopy bid documents can be purchased at RCI Printing and Graphics. All addendums will be distributed by RCI or found on the State of Delaware Bid Solicitation Directory website.

#### **Pre-Bid Meeting Notes**

- 1.Attendance at the Pre-Bid Meeting is mandatory. A copy of the sign in sheet is attached.

- 2.General Project Scope Review

- a. Project involves the resurfacing of the half mile running track located at the Bethany Beach Training Site with a polyurethane synthetic surface, including all substructure and drainage, in addition to signage for 2-mile run physical fitness testing.
- b. Alternate #1: Furnish and install perimeter lighting around the running track, including all associated electrical and site work.

- 3.Bid Form Review

- a. Complete forms as presented, do not edit or alter.
- b. Provide all information requested in full or bid will not be accepted.
- c. Acknowledge all addendums as individual items.
- d. Contract time shall indicate full contract time from Notice to Proceed through Closeout.
- e. Contractor to provide Affidavit of Employee Drug Testing Program with submission of bids. Subcontractor's Employee Drug Testing Forms will be required, post bid, from the successful bidder.
- f. List all Sub-contractors and any third-tier sub-contractors performing work.
- g. If Contractor is self-performing work, please list as part of sub-contractor list.

- 4.Sub-Contractor List Review

- a. Proposed trades will be included as listed contractors:
  - i. Resurfacing
  - ii. Paving
  - iii. Electrical

- 5.Alternates Review

- a. Add Alternate #1: Furnish and install perimeter lighting around the running track, including all associated electrical and site work.

- 6.Unit Prices Review

- a. None

- 7.Allowances Review

- a. Allowance No. 1: Owner's Contingency – For general contingencies and repairs, the remaining balance of which is to be returned to the Owner by credit change order at project conclusion. Ten thousand dollars (\$ 10,000.00)

- 8.Prevaling Wage Project

9.2025 wage rates apply. See attached new Wage Rates.

10. Schedule

- a. The Owner anticipates Contract award within approximately (30) days of the bid opening. The successful Contractor will be required to execute the Contract and provide associated bonds and insurance certificates within 20 days of Notice of Award.

11. Contractor Use of Premises

- a. Construction Operations: Limited to the building premises.
  - i. Work hours are between 8:00 am to 4:30 pm, Monday through Friday. Alternate hours will only be considered on a special-need basis.
  - ii. Laydown space limited to area of work and coordinated with the Owner. Tentatively noted the parking spots across from the entrance can be used for laydown, dumpsters, etc.
  - iii. Contractor shall be responsible for providing porta-potty.
  - iv. Contractor shall be responsible for receiving & securing all materials.
- b. Provide access to and from site as required by law and by Owner:
  - i. Do not obstruct roadways, sidewalks, or other public ways without permit.
  - ii. Parking is available, to be coordinated with Owner.
- c. Utility Outage and Shutdown:
  - i. Coordinate any interruption and/ or shutdown of utilities with DEARNG at least 14 days in advance of anticipated interruption and/ or shutdown. Limit any interruptions/ shutdowns to the absolute minimum amount of time.
  - ii. Coordinate any access outside area of work with DEARNG at least 7 days in advance of anticipated need for access. This is to provide ample time for notification of the the building occupants.
  - iii. DEARNG reserves the right to reschedule constructions shutdowns with a minimal warning to the contractor as required to respond to emergencies.

12. Owner Occupancy

- a. The owner will occupy the site throughout construction.

13. Permitting

- a. All construction permit submissions and fees shall be by the contractor.

14. Please note the advertised specs were missing Division 31 and 32. Refer to the complete bid specs.

15. Sub-contractor walkthrough **April 14, 2025, 11:00AM-12:00PM**. Notify Gabriel Cheung via e-mail if you plan to attend this walk through.

16. Note that Drill Weekends occur monthly. DEARNG advised that the Contractor is authorized to work on Fridays of Drill Weekends. However, the Contractor is to use caution as many personnel will be present.

17. If mailing bids, mail in advance to avoid not being received in time. Prefer hand deliver.
18. Background Access Check Form shall be filled out by the successful bidder. Good for three years.
19. Noted Federal Regulations Article VIII, referencing Buy American Act, included in bid documents.
20. Substitution request for Synthetic Running Track Surfacing was submitted and approved. Proposed substitution is Plexitrac Accelerator by ICP Building Solutions Group.

**Attachments:**

1. Sign In Sheet
2. Revised Front Ends
  - a. 00 01 10 – Table of Contents
  - b. 00 41 13 – Bid Forms
  - c. Revised Wage Rates
3. Added Specifications
  - a. 01 23 00 – ALTERNATES
  - b. 03 30 00 – CAST-IN-PLACE CONCRETE
  - c. Division 26 – See Table of Contents
  - d. 33 71 19 – ELECTRICAL UNDERGROUND DUCTS, DUCTBANKS, AND MANHOLES
4. Substitution material for Synthetic Running Track Surfacing.
5. Drawings
  - a. Revised C-100 – Existing Conditions Plan
    - i. Revised Project Data
    - ii. Revised General Notes 1.
  - b. Revised C-101 – Proposed Conditions Plan
    - i. Revised drawing to include Alternate #1 for bollards, lighted bollards, and underground electric.
    - ii. Revised Sequence of Constriction Note 5 to reference Alternate #1.
    - iii. Added Utility Installation Notes for Alternate #1.
  - c. Revised C-102 – Construction Site Details and Notes
    - i. Added bollard detail.
  - d. Added E-000 – Electrical Cover Sheet
  - e. Added E-101 – Electrical Plans – Alternate #1
  - f. Added E-102 – Electrical Enlarged and Overall Plans – Alternate #1

- g. Added E-500 – Electrical Details – Alternate #1
- h. Added E-600 – Electrical Single Line Diagram & Panel Schedule – Alternate #1

**END**

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**HEADQUARTERS**

2500 WRANGLE HILL ROAD  
FOX RUN OFFICE PLAZA, SUITE 110  
BEAR, DE 19701

302.832.1652 **PHONE**  
302.832.1423 **FAX**

ARCHITECTS

ENGINEERS

FACILITIES SOLUTIONS

Project: Bethany Beach Training Site – Running Track Resurfacing and Lighting

Project No.: DEARNG Contract No. 2023-13

Time and Date: 11:00 AM / April 2, 2025

Time End: 11:45 AM

**PRE-BID SIGN IN SHEET**  
**(INDIVIDUALS MAY ONLY SIGN IN FOR THEMSELVES)**

| REPRESENTATIVE            | FIRM / PHONE / FAX / EMAIL                                                                           | TIME SIGNED   |
|---------------------------|------------------------------------------------------------------------------------------------------|---------------|
| 1. <u>Jim Giveus</u>      | <u>Kinsley Construction</u><br><u>302-614-1237</u><br><u>jgiveus@kinsleyconstruction.com</u>         | <u>10:40'</u> |
| 2. <u>Justin Reintke</u>  | <u>Beynon Sports Surfaces</u><br><u>443-401-2528</u><br><u>jreintke@beynon sports.com</u>            | <u>10:49</u>  |
| 3. <u>Marc Gallagher</u>  | <u>American Athletic Track and Turf</u><br><u>856-426-1555</u><br><u>mgallagher@trackandturf.com</u> | <u>10:50</u>  |
| 4. <u>Melissa Worrell</u> | <u>Stratified, Inc</u><br><u>410-562-0916</u><br><u>mworrell@stratified.us</u>                       | <u>11:00</u>  |
| 5. <u>Brian Morgan</u>    | <u>Site Studios, Inc.</u><br><u>443-553-5455</u><br><u>bmorgan@sitestudiosinc.com</u>                | <u>10:45</u>  |

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|     | REPRESENTATIVE | FIRM / PHONE / FAX / EMAIL | TIME SIGNED |
|-----|----------------|----------------------------|-------------|
| 6.  | LARRY SCHROCK  | DNG                        | 10:45       |
|     |                |                            |             |
|     |                |                            |             |
|     |                |                            | 10:45       |
| 7.  | EDWARD LOPINEK | STUDIO JAED                |             |
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| 8.  |                |                            |             |
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| 10. |                |                            |             |
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|     |                |                            |             |

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| REPRESENTATIVE | FIRM / PHONE / FAX / EMAIL       | TIME SIGNED                      |
|----------------|----------------------------------|----------------------------------|
| 11. _____      | _____<br>_____<br>_____<br>_____ | _____<br>_____<br>_____<br>_____ |
| 12. _____      | _____<br>_____<br>_____<br>_____ | _____<br>_____<br>_____<br>_____ |
| 13. _____      | _____<br>_____<br>_____<br>_____ | _____<br>_____<br>_____<br>_____ |
| 14. _____      | _____<br>_____<br>_____<br>_____ | _____<br>_____<br>_____<br>_____ |
| 15. _____      | _____<br>_____<br>_____<br>_____ | _____<br>_____<br>_____<br>_____ |

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**SECTION 00 01 10**

**TABLE OF CONTENTS**

- A. Specifications for this project are arranged in accordance with the Construction Specification Institute numbering system and format. Section numbering is discontinuous and all numbers not appearing in the Table of Contents are not used for this Project.
- B. DOCUMENTS BOUND HEREWITH

**DIVISION 00 – PROCUREMENT AND CONTRACT REQUIREMENTS**

**INTRODUCTORY INFORMATION**

- 00 01 01 – PROJECT TITLE PAGE
- 00 01 07 – SEALS PAGE
- 00 01 10 – TABLE OF CONTENTS
- 00 01 15 – LIST OF DRAWING SHEETS

**PROCUREMENT REQUIREMENTS**

- 00 11 16 – INVITATION TO BID
- 00 21 13 – INSTRUCTIONS TO BIDDERS
- 00 41 13 – BID FORM
- 00 43 13 – BID BOND

**CONTRACTING REQUIREMENTS**

- 00 52 13 – STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR  
(SAMPLE AIA A101-2017)  
(SAMPLE AIA A101-2017 – EXHIBIT A)
- 00 54 13 – SUPPLEMENT TO AGREEMENT BETWEEN OWNER AND CONTRACTOR A101-201
- 00 54 14 – SUPPLEMENT TO A101-2017 – EXHIBIT A – INSURANCE & BONDS
- 00 61 13.13 – PERFORMANCE BOND
- 00 61 13.16 – PAYMENT BOND
- 00 62 76 – APPLICATION AND CERTIFICATE FOR PAYMENT FORMS  
(SAMPLE AIA G702 & G703)
- 00 65 01 – CLOSEOUT DOCUMENTS CHECKLIST
- 00 72 13 – GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION A201-2017  
(SAMPLE AIA A201-2017)

00 73 13 – SUPPLEMENTARY GENERAL CONDITIONS A201 – 2017

00 73 43 – WAGE RATE REQUIREMENTS

00 73 46 – WAGE RATE DETERMINATION SCHEDULE

00 81 13 – GENERAL REQUIREMENTS

00 81 13.5 – FEDERAL REGULATIONS – ARTICLE VIII

00 81 14 – DRUG TESTING FORMS

00 81 15 – AFFIDAVIT OF CRAFT TRAINING COMPLIANCE

**DIVISION 01 – GENERAL REQUIREMENTS**

01 10 00 – SUMMARY

01 20 00 – PRICE AND PAYMENT PROCEDURES

01 21 00 – ALLOWANCES

01 21 16 – ALLOWANCE AUTHORIZATION

01 23 00 – ALTERNATES

01 25 00 – SUBSTITUTION PROCEDURES

01 30 00 – ADMINISTRATIVE REQUIREMENTS

01 31 00 – PROJECT MANAGEMENT AND COORDINATION

01 32 16 – CONSTRUCTION PROGRESS SCHEDULE

01 33 00 – SUBMITTAL PROCEDURES

01 35 53 – SECURITY PROCEDURES

01 35 53.23 – DEARNG SECURITY REQUIREMENTS AND PROCEDURES

01 40 00 – QUALITY REQUIREMENTS

01 42 16 – DEFINITIONS

01 50 00 – TEMPORARY FACILITIES AND CONTROLS

01 57 13 – TEMPORARY EROSION AND SEDIMENT CONTROL

01 60 00 – PRODUCT REQUIREMENTS

01 61 16 – VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

01 70 00 – EXECUTION AND CLOSEOUT REQUIREMENTS

01 73 29 – CUTTING AND PATCHING

01 74 19 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

01 78 00 – CLOSEOUT SUBMITTALS

**DIVISION 02 – EXISTING CONDITIONS**

02 41 00 – DEMOLITION

**DIVISION 03 – CONCRETE**

03 30 00 – CAST-IN-PLACE CONCRETE

**DIVISION 26 -- ELECTRICAL**

26 05 01 – MINOR ELECTRICAL DEMOLITION

26 05 19 – LV POWER CONDUCTORS & CABLES (600V&LESS)

26 05 26 – GROUNDING & BONDING FOR ELECTRICAL SYSTEMS

26 05 29 – HANGERS & SUPPORTS FOR ELECTRICAL WORK

26 05 33.16 – BOXES

26 05 34 – CONDUIT

26 05 53 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

26 09 23 – LIGHTING CONTROL DEVICES

26 22 00 – LOW-VOLTAGE TRANSFORMERS

26 24 16 – PANELBOARDS

26 27 26 – WIRING DEVICES

26 56 00 – EXTERIOR LIGHTING

**DIVISION 31 -- EARTHWORK**

31 20 00 – EARTH MOVING

**DIVISION 32 – EXTERIOR IMPROVEMENTS**

32 12 16 – ASPHALT PAVING

32 18 18 – SYNTHETIC TRACK SURFACING SYSTEM

**DIVISION 33 – UTILITIES**

33 71 19 – ELECTRICAL UNDERGROUND DUCTS, DUCTBANKS, AND MANHOLES

**END OF SECTION**

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Running Track Resurfacing and Lighting  
DEARNG Contract No. 2023-13

**Bethany Beach Training Site – Running Track Resurfacing and Lighting**  
**163 Scannell Blvd, Bethany Beach, DE 19930**  
**DEARNG Contract No. 2023-13**

**Bethany Beach Training Site – Running Track Resurfacing and Lighting**  
**163 Scannell Blvd, Bethany Beach, DE 19930**  
**DEARNG Contract No. 2023-13**

**BID FORM**

I/We acknowledge Addendums numbered \_\_\_\_\_ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for thirty (30) days from the date of opening of bids (60 days for School Districts and Department of Education), and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid.

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within \_\_\_\_\_ calendar days of the Notice to Proceed.

The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By \_\_\_\_\_ Trading as \_\_\_\_\_  
(Individual's / General Partner's / Corporate Name)  
\_\_\_\_\_  
(State of Corporation)

Business Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Witness:** \_\_\_\_\_ **By:** \_\_\_\_\_  
(SEAL) ( Authorized Signature )  
\_\_\_\_\_  
( Title )  
**Date:** \_\_\_\_\_

**ATTACHMENTS**

Sub-Contractor List  
Non-Collusion Statement  
Affidavit of Employee Drug Testing Program  
Affidavit of Contractor Qualifications  
Bid Security  
(Others as Required by Project Manuals)

Bethany Beach Training Site  
February 17, 2025

Running Track Resurfacing and Lighting  
DEARNG Contract No. 2023-13

**Added per Addendum #1 on April 7, 2025**

**Bethany Beach Training Site – Running Track Resurfacing and Lighting  
163 Scannell Blvd, Bethany Beach, DE 19930  
DEARNG Contract No. 2023-13**

## **BID FORM**

### **SUBCONTRACTOR LIST**

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (\*) next to any additional third-tier contractors, and submit it with your bid.

| <u>Subcontractor Category</u> | <u>Subcontractor</u> | <u>Address (City &amp; State)</u> | <u>Subcontractors tax-payer ID #<br/>or Delaware Business license #</u> |
|-------------------------------|----------------------|-----------------------------------|-------------------------------------------------------------------------|
| 1. Resurfacing                | _____                | _____                             | _____                                                                   |
| A.                            | _____                | _____                             | _____                                                                   |
| B.                            | _____                | _____                             | _____                                                                   |
| C.                            | _____                | _____                             | _____                                                                   |
| 2. Paving                     | _____                | _____                             | _____                                                                   |
| A.                            | _____                | _____                             | _____                                                                   |
| B.                            | _____                | _____                             | _____                                                                   |
| C.                            | _____                | _____                             | _____                                                                   |

Running Track Resurfacing and Lighting  
DEARNG Contract No. 2023-13  
**Added per Addendum #1 on April 7, 2025**

Bethany Beach Training Site  
February

17,

2025

**Bethany Beach Training Site – Running Track Resurfacing and Lighting**  
**163 Scannell Blvd, Bethany Beach, DE 19930**  
**DEARNG Contract No. 2023-13**

**BID FORM (Continued)**

|    |            |       |       |       |
|----|------------|-------|-------|-------|
| 3. | Electrical | <hr/> | <hr/> | <hr/> |
|    | A.         | <hr/> | <hr/> | <hr/> |
|    | B.         | <hr/> | <hr/> | <hr/> |
|    | C.         | <hr/> | <hr/> | <hr/> |

Bethany Beach Training Site  
February 17, 2025

Running Track Resurfacing and Lighting  
DEARNG Contract No. 2023-13  
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**Bethany Beach Training Site – Running Track Resurfacing and Lighting**  
**163 Scannell Blvd, Bethany Beach, DE 19930**  
**DEARNG Contract No. 2023-13**

## **BID FORM**

### **NON-COLLUSION STATEMENT**

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date (*to the Delaware Army National Guard*).

All the terms and conditions of (*DEARNG Contract No. 2023-13*) have been thoroughly examined and are understood.

**NAME OF BIDDER:**

\_\_\_\_\_

**AUTHORIZED REPRESENTATIVE  
(TYPED):**

\_\_\_\_\_

**AUTHORIZED REPRESENTATIVE  
(SIGNATURE):**

\_\_\_\_\_

**TITLE:**

\_\_\_\_\_

**ADDRESS OF BIDDER:**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**E-MAIL:**

\_\_\_\_\_

**PHONE NUMBER:**

\_\_\_\_\_

Sworn to and Subscribed before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_.

My Commission expires \_\_\_\_\_. NOTARY PUBLIC \_\_\_\_\_.

**THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.**

**AFFIDAVIT  
OF  
EMPLOYEE DRUG TESTING PROGRAM**

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

**Contractor/Subcontractor Name:** \_\_\_\_\_

**Contractor/Subcontractor Address:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**Authorized Representative (typed or printed):** \_\_\_\_\_

**Authorized Representative (signature):** \_\_\_\_\_

**Title:** \_\_\_\_\_

Sworn to and Subscribed before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_.

My Commission expires \_\_\_\_\_. NOTARY PUBLIC \_\_\_\_\_.

**THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.**

Bethany Beach Training Site  
February 17, 2025

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163 Scannell Blvd, Bethany Beach, DE 19930  
DEARNG Contract No. 2023-13**

**AFFIDAVIT  
OF  
CONTRACTOR QUALIFICATIONS**

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

**Contractor Name:** \_\_\_\_\_

**Contractor Address:** \_\_\_\_\_

**Authorized Representative (typed or printed):** \_\_\_\_\_

**Authorized Representative (signature):** \_\_\_\_\_

**Title:** \_\_\_\_\_

Sworn to and Subscribed before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_.

My Commission expires \_\_\_\_\_. NOTARY PUBLIC \_\_\_\_\_.

**THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.**

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STATE OF DELAWARE  
DEPARTMENT OF LABOR  
DIVISION OF INDUSTRIAL AFFAIRS  
OFFICE OF LABOR LAW ENFORCEMENT  
PHONE: (302) 318-2769

Mailing Address:  
252 Chapman Road  
Suite 210  
Newark, DE 19702

Located at:  
252 Chapman Road  
Suite 210  
Newark, DE 19702

PREVAILING WAGES FOR HEAVY CONSTRUCTION EFFECTIVE MARCH 14, 2025

| CLASSIFICATION                    | NEW CASTLE | KENT   | SUSSEX |
|-----------------------------------|------------|--------|--------|
| ASBESTOS WORKERS                  | 28.89      | 25.41  | 55.24  |
| BOILERMAKERS                      | 90.82      | 41.97  | 77.00  |
| BRICKLAYERS                       | 90.12      | 77.39  | 32.55  |
| CARPENTERS                        | 62.56      | 62.56  | 50.80  |
| CEMENT FINISHERS                  | 56.98      | 31.82  | 23.71  |
| DIVER                             | 103.26     | -      | -      |
| DIVER TENDER                      | 116.61     | -      | -      |
| ELECTRICAL LINE WORKERS           | 96.29      | 96.29  | 96.29  |
| ELECTRICIANS                      | 83.92      | 83.92  | 83.92  |
| GLAZIERS                          | 26.67      | 23.17  | 15.70  |
| INSULATORS                        | 69.12      | 69.12  | 69.12  |
| IRON WORKERS                      | 78.58      | 79.67  | 78.58  |
| LABORERS                          | 57.65      | 57.65  | 57.65  |
| MILLWRIGHTS                       | 88.35      | 88.35  | 70.97  |
| PAINTERS                          | 95.76      | 95.76  | 95.76  |
| PILEDRIVERS                       | 91.12      | 51.44  | 40.03  |
| PLASTERERS                        | 25.12      | 21.85  | 15.00  |
| PLUMBERS/PIPEFITTERS/STEAMFITTERS | 99.88      | 101.73 | 25.47  |
| POWER EQUIPMENT OPERATORS         | 83.29      | 89.93  | 83.29  |
| SHEET METAL WORKERS               | 40.16      | 24.92  | 23.41  |
| SPRINKLER FITTERS                 | 43.29      | 16.39  | 15.00  |
| TRUCK DRIVERS                     | 44.77      | 26.88  | 29.10  |

CERTIFIED: 3/21/2025

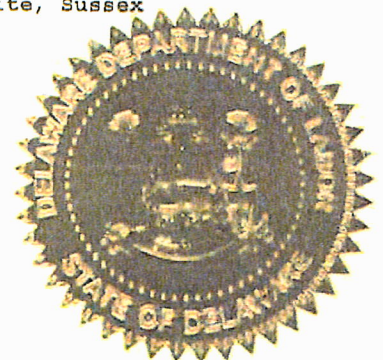
BY: [Signature] For Fran Chudzick  
ADMINISTRATOR, OFFICE OF LABOR LAW ENFORCEMENT

NOTE: THESE RATES ARE PROMULGATED AND ENFORCED PURSUANT TO THE PREVAILING WAGE REGULATIONS ADOPTED BY THE DEPARTMENT OF LABOR ON APRIL 3, 1992.

CLASSIFICATIONS OF WORKERS ARE DETERMINED BY THE DEPARTMENT OF LABOR. FOR ASSISTANCE IN CLASSIFYING WORKERS, OR FOR A COPY OF THE REGULATIONS OR CLASSIFICATIONS, PHONE (302) 318-2769.

NON-REGISTERED APPRENTICES MUST BE PAID THE MECHANIC'S RATE.

PROJECT: 2023-13 Running Track Resurfacing at Bethany Beach Training Site, Sussex County



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**SECTION 01 23 00**  
**ALTERNATES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Description of Alternates.
- B. Procedures for pricing Alternates.
- C. Documentation of changes to Contract Price and Contract Time.

**1.02 RELATED REQUIREMENTS**

- A. Document 00 21 13 - Instructions to Bidders: Instructions for preparation of pricing for Alternates.
- B. Document 00 43 23 - Alternates Form: List of Alternates as supplement to Bid Form.
- C. Document 00 52 00 - Agreement Form: Incorporating monetary value of accepted Alternates.

**1.03 ACCEPTANCE OF ALTERNATES**

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

**1.04 SCHEDULE OF ALTERNATES**

- A. Alternate No. 1 - Furnish and install perimeter lighting around running track.:

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

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**SECTION 03 30 00  
CAST-IN-PLACE CONCRETE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Concrete formwork.
- B. Concrete reinforcement.
- C. Miscellaneous concrete elements, including equipment pads.
- D. Concrete curing.

**1.02 REFERENCE STANDARDS**

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.
- C. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- D. ACI PRC-308 - Guide to External Curing of Concrete; 2016.
- E. ACI PRC-347 - Guide to Formwork for Concrete; 2014 (Reapproved 2021).
- F. ACI SPEC-117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- G. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- H. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- I. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2019.
- J. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2023.
- K. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2021.
- L. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
- M. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2023.
- N. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
  - 1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
- C. Mix Design: Submit proposed concrete mix design.
  - 1. Indicate proposed mix design complies with requirements of ACI SPEC-301, Section 4 - Concrete Mixtures.
- D. Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used.

#### **1.04 QUALITY ASSURANCE**

- A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.

#### **1.05 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

### **PART 2 PRODUCTS**

#### **2.01 FORMWORK**

- A. Formwork Design and Construction: Comply with guidelines of ACI PRC-347 to provide formwork that will produce concrete complying with tolerances of ACI SPEC-117.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.

#### **2.02 REINFORCEMENT MATERIALS**

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
  - 1. Type: Deformed billet-steel bars.
  - 2. Finish: Unfinished, unless otherwise indicated.
  - 3. Finish: Galvanized in accordance with ASTM A767/A767M, Class I, unless otherwise indicated.

#### **2.03 CONCRETE MATERIALS**

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
  - 1. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
  - 1. Acquire aggregates for entire project from same source.
- C. Lightweight Aggregate: ASTM C330/C330M.
- D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

#### **2.04 ADMIXTURES**

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

#### **2.05 CURING MATERIALS**

- A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.

#### **2.06 CONCRETE MIX DESIGN**

- A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.
  - 1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.
- B. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.
- C. Normal Weight Concrete:
  - 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.
  - 2. Water-Cement Ratio: Maximum 40 percent by weight.
  - 3. Maximum Aggregate Size: 5/8 inch.

#### **2.07 MIXING**

- A. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

#### **3.02 PREPARATION**

- A. Formwork: Comply with requirements of ACI SPEC-301. Design and fabricate forms to support all applied loads until concrete is cured and for easy removal without damage to concrete.

#### **3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS**

- A. Comply with requirements of ACI SPEC-301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

#### **3.04 PLACING CONCRETE**

- A. Place concrete in accordance with ACI PRC-304.

#### **3.05 CONCRETE FINISHING**

- A. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
  - 1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

#### **3.06 CURING AND PROTECTION**

- A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

#### **3.07 DEFECTIVE CONCRETE**

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

#### **3.08 PROTECTION**

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

**END OF SECTION**

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**SECTION 26 05 01**  
**MINOR ELECTRICAL DEMOLITION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Electrical demolition.

**PART 2 PRODUCTS**

**2.01 MATERIALS AND EQUIPMENT**

- A. Materials and equipment for patching and extending work: As specified in individual sections.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify field measurements and circuiting arrangements are as shown on Drawings.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on casual field observation .
- D. Report discrepancies to Owner before disturbing existing installation.
- E. Report discrepancies to Architect before disturbing existing installation.
- F. Beginning of demolition means installer accepts existing conditions.

**3.02 PREPARATION**

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate utility service outages with utility company.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
  - 1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
  - 2. Make temporary connections to maintain service in areas adjacent to work area.
- E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
  - 1. Notify Owner before partially or completely disabling system.
  - 2. Notify local fire service.
  - 3. Make notifications at least 24 hours in advance.
  - 4. Make temporary connections to maintain service in areas adjacent to work area.

**3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK**

- A. Remove, relocate, and extend existing installations to accommodate new construction.
- B. Remove abandoned wiring to source of supply.
- C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- E. Disconnect and remove abandoned panelboards and distribution equipment.
- F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

- G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- H. Repair adjacent construction and finishes damaged during demolition and extension work.
- I. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- J. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

#### **3.04 CLEANING AND REPAIR**

- A. Clean and repair existing materials and equipment that remain or that are to be reused.
- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- C. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.
- D. Any lighting or ceiling-mounted devices removed during construction must be reinstalled.

**END OF SECTION**

**SECTION 26 05 19**  
**LV POWER CONDUCTORS & CABLES (600V&LESS)**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Single conductor building wire.
- B. Wire and cable for 600 volts and less.
- C. Wiring connectors.
- D. Electrical tape.
- E. Wire pulling lubricant.

**1.02 REFERENCE STANDARDS**

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.
- F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- G. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2009.
- H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- K. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- L. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- M. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- N. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- O. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
  - 3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

**1.04 SUBMITTALS**

- A. See Section 01 33 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C. Product Data: Provide for each cable assembly type.
- D. Samples of Actual Product Delivered: Submit one 18 inch length of cable assembly from each reel.
  - 1. Select each length to include complete set of manufacturer markings.
  - 2. Attach tag indicating cable size and application information.
- E. Test Reports: Indicate procedures and values obtained.
- F. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.
- G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- H. Project Record Documents: Record actual locations of components and circuits.

#### **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

#### **1.07 FIELD CONDITIONS**

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

### **PART 2 PRODUCTS**

#### **2.01 CONDUCTOR AND CABLE APPLICATIONS**

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Concealed Dry Interior Locations: Use only building wire in raceway type THHN/THHW.
- D. Exposed Dry Interior Locations: Use only building wire in raceway type THHN/THHW.
- E. Above Accessible Ceilings: Use only building wire in raceway type THHN.
- F. Wet or Damp Interior Locations: Use only building wire in raceway type THW.
- G. Exterior Locations: Use only building wire in raceway type THHW.
- H. Use solid conductor for feeders and branch circuits 10 AWG and smaller.
- I. Use solid conductors for control circuits.
- J. Use conductor not smaller than 12 AWG for power and lighting circuits.
- K. Use conductor not smaller than 16 AWG for control circuits.

**Added per Addendum #1 on April 7, 2025**

- L. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.
- M. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.

## **2.02 CONDUCTOR AND CABLE MANUFACTURERS**

- A. Cerro Wire LLC: [www.cerrowire.com](http://www.cerrowire.com).
- B. Southwire Company: [www.southwire.com](http://www.southwire.com).
- C. Substitutions: See Section 01 60 00 - Product Requirements.

## **2.03 CONDUCTOR AND CABLE GENERAL REQUIREMENTS**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose indicated.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.
- H. Conductor Material:
  - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
  - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B 787M unless otherwise indicated.
  - 3. Tinned Copper Conductors: Comply with ASTM B33.
- I. Minimum Conductor Size: 12 AWG.
  - 1. Branch Circuits: 12 AWG.
    - a. Exceptions:
      - 1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
      - 2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
      - 3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
  - 2. Control Circuits: 14 AWG.
- J. Conductor Color Coding:
  - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
  - 2. Color Coding Method: Integrally colored insulation.
    - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
  - 3. Color Code:
    - a. 480Y/277 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Brown.
      - 2) Phase B: Orange.
      - 3) Phase C: Yellow.
      - 4) Neutral/Grounded: Gray.
    - b. 208Y/120 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Phase C: Blue.
      - 4) Neutral/Grounded: White.
    - c. Equipment Ground, All Systems: Green.

- d. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
- e. For control circuits, comply with manufacturer's recommended color code.

## **2.04 SINGLE CONDUCTOR BUILDING WIRE**

- A. Manufacturers:
  - 1. Copper Building Wire:
    - a. Cerro Wire LLC: [www.cerrowire.com/#sle](http://www.cerrowire.com/#sle).
    - b. Encore Wire Corporation: [www.encorewire.com/#sle](http://www.encorewire.com/#sle).
    - c. Southwire Company: [www.southwire.com/#sle](http://www.southwire.com/#sle).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
  - 1. Feeders and Branch Circuits:
    - a. Size 10 AWG and Smaller: Solid.
    - b. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
  - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
- F. Conductor: Copper.
  - 1. For Sizes Smaller Than 4 AWG: Copper.
  - 2. For Sizes 4 AWG and Larger: Copper.
- G. Insulation Voltage Rating: 600 volts.
- H. Insulation: NFPA 70, Type THHW/THWN/THHN/THW.
- I. Insulation: Thermoplastic material rated 75/90 degrees C.

## **2.05 WIRING CONNECTORS**

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.
- C. Wiring Connectors for Splices and Taps:
  - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
  - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
  - 1. Manufacturers:
    - a. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
    - b. Ideal Industries, Inc: [www.idealindustries.com/#sle](http://www.idealindustries.com/#sle).
    - c. NSI Industries LLC: [www.nsiindustries.com/#sle](http://www.nsiindustries.com/#sle).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Mechanical Connectors: Provide bolted type or set-screw type.
- F. Compression Connectors: Provide circumferential type or hex type crimp configuration.

## **2.06 WIRING ACCESSORIES**

- A. Electrical Tape:
  - 1. Manufacturers:
    - a. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).

**Added per Addendum #1 on April 7, 2025**

- b. Plymouth Rubber Europa: [www.plymouthrubber.com/#sle](http://www.plymouthrubber.com/#sle).
  - c. Substitutions: See Section 01 60 00 - Product Requirements.
- 2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
- 3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
- B. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
  - 1. Manufacturers:
    - a. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
    - b. American Polywater Corporation: [www.polywater.com/#sle](http://www.polywater.com/#sle).
    - c. Ideal Industries, Inc: [www.idealindustries.com/#sle](http://www.idealindustries.com/#sle).
- C. Split Bolt Connectors: Description: Connector suitable for copper to copper connection tested and listed to UL 486A requirements. Black burn type-H or equal.
  - 1. Product: Thomas R Betts or equal
  - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Spring Wire Connectors: Description: Flame retardant thermoplastic shell with plated steel square wire spring gated for 105 degrees C, 600 volts, Thomas and Betts fixed spring wire connectors or equal.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that raceway installation is complete and supported.
- E. Verify that field measurements are as shown on the drawings.
- F. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 PREPARATION**

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

### **3.03 INSTALLATION**

- A. Circuiting Requirements:
  - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
  - 2. When circuit destination is indicated and routing is not shown, determine exact routing required.
  - 3. Arrange circuiting to minimize splices.
- B. Install products in accordance with manufacturer's instructions.
- C. Install conductors and cable in a neat and workmanlike manner in accordance with NECA 1.
- D. Installation in Raceway:
  - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
  - 2. Pull all conductors and cables together into raceway at same time.
  - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.

4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- G. Install conductors with a minimum of 12 inches of slack at each outlet.
- H. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- I. Make wiring connections using specified wiring connectors.
  1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
  2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  3. Do not remove conductor strands to facilitate insertion into connector.
  4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
  5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- J. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
- K. Insulate ends of spare conductors using vinyl insulating electrical tape.
- L. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- M. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified.
- N. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.
- O. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1.
- P. Route wire and cable as required to meet project conditions.
  1. Wire and cable routing indicated is approximate unless dimensioned.
  2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.
  3. Include wire and cable of lengths required to install connected devices within 10 ft of location shown.
- Q. Use wiring methods indicated.
- R. Pull all conductors into raceway at same time.
- S. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- T. Protect exposed cable from damage.
- U. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.
- V. Use suitable cable fittings and connectors.
- W. Neatly train and lace wiring inside boxes, equipment, and panelboards.

**Added per Addendum #1 on April 7, 2025**

- X. Clean conductor surfaces before installing lugs and connectors.
- Y. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- Z. Use suitable reducing connectors or mechanical connector adaptors for connecting aluminum conductors to copper conductors.
- AA. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
- AB. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
- AC. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
- AD. Identify and color code wire and cable as specified. Identify each conductor with its circuit number or other designation indicated.

### **3.04 FIELD QUALITY CONTROL**

- A. Perform inspection, testing, and adjusting in accordance with Section 01 40 00 Quality Requirements.
- B. Perform field inspection and testing in accordance with Section 01 40 00 Quality Requirements.
- C. Inspect and test in accordance with NETA STD ATS, except Section 4.
- D. Perform inspections and tests listed in NETA STD ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
- E. Correct deficiencies and replace damaged or defective conductors and cables.
- F. Perform inspections and tests listed in NETA STD ATS, Section 7.3.2.

**END OF SECTION**

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**SECTION 26 05 26**  
**GROUNDING & BONDING ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.
- F. Grounding and bonding components.
- G. Provide all components necessary to complete the grounding system(s) consisting of:
  - 1. Existing metal underground water pipe.
  - 2. Metal frame of the building.
  - 3. Existing metal underground gas piping system.
  - 4. Metal underground gas piping system.

**1.02 REFERENCE STANDARDS**

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2007.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- E. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2007.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Grounding System Resistance: 25 ohms.

**1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- C. Shop Drawings:
  - 1. Indicate proposed arrangement for signal reference grids. Include locations of items to be bonded and methods of connection.
- D. Product Data: Provide for grounding electrodes and connections.
- E. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

- F. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Project Record Documents: Record actual locations of grounding electrode system components and connections.
- H. Project Record Documents: Record actual locations of components and grounding electrodes.

#### **1.06 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Installer Qualifications for Signal Reference Grids: Company with minimum five years documented experience with high frequency grounding systems.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience with service facilities within 100 miles of Project.
- C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

### **PART 2 PRODUCTS**

#### **2.01 GROUNDING AND BONDING REQUIREMENTS**

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding System Resistance:
  - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
  - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
  - 3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.
- F. Bonding and Equipment Grounding:
  - 1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical

conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.

2. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
3. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
4. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
5. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
6. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
  - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.

## 2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
  1. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
  2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in addition to requirements of Section 26 05 19:
  1. Use insulated copper conductors unless otherwise indicated.
    - a. Exceptions:
      - 1) Use bare copper conductors where installed underground in direct contact with earth.
      - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
  1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
  2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
    - a. Exceptions:
      - 1) Use mechanical connectors for connections to electrodes at ground access wells.
  3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
    - a. Exceptions:
      - 1) Use exothermic welded connections for connections to metal building frame.
  4. Manufacturers - Mechanical and Compression Connectors:
    - a. Advanced Lightning Technology (ALT): [www.altfab.com/#sle](http://www.altfab.com/#sle).
    - b. Burndy LLC: [www.burndy.com](http://www.burndy.com).
    - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
  5. Manufacturers - Exothermic Welded Connections:
    - a. Burndy LLC: [www.burndy.com](http://www.burndy.com).
    - b. Cadweld, a brand of Erico International Corporation: [www.erico.com/#sle](http://www.erico.com/#sle).
    - c. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Ground Bars:
  1. Description: Copper rectangular ground bars with mounting brackets and insulators.
  2. Size: As indicated.
  3. Holes for Connections: As indicated or as required for connections to be made.
  4. Manufacturers:

- a. Advanced Lightning Technology (ALT): [www.altfab.com/#sle](http://www.altfab.com/#sle).
  - b. Erico International Corporation: [www.erico.com/#sle](http://www.erico.com/#sle).
  - c. Harger Lightning & Grounding: [www.harger.com/#sle](http://www.harger.com/#sle).
  - d. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Ground Rod Electrodes:
- 1. Comply with NEMA GR 1.
  - 2. Material: Copper-bonded (copper-clad) steel.
  - 3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.
  - 4. Manufacturers:
    - a. Advanced Lightning Technology (ALT): [www.altfab.com/#sle](http://www.altfab.com/#sle).
    - b. Erico International Corporation: [www.erico.com/#sle](http://www.erico.com/#sle).
    - c. Harger Lightning & Grounding: [www.harger.com/#sle](http://www.harger.com/#sle).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.

## **2.03 MANUFACTURERS**

- A. Cooper Power Systems: [www.cooperpower.com](http://www.cooperpower.com).
- B. Framatome Connectors International: [www.fcconnect.com](http://www.fcconnect.com).
- C. Lightning Master Corporation: [www.lightningmaster.com](http://www.lightningmaster.com).
- D. Substitutions: See Section 01 60 00 - Product Requirements.

## **2.04 CONNECTORS AND ACCESSORIES**

- A. Mechanical Connectors: Bronze.
  - 1. Product: Type H manufactured by Thomas and Betts or equal.
  - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Wire: Stranded copper.
- C. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as shown on the drawings.
- C. Verify that conditions are satisfactory for installation prior to starting work.
- D. Verify existing conditions prior to beginning work.
- E. Verify that final backfill and compaction has been completed before driving rod electrodes.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install grounding and bonding system components in a neat and workmanlike manner in accordance with NECA 1.
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
  - 1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.
- D. Make grounding and bonding connections using specified connectors.
  - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.

**Added per Addendum #1 on April 7, 2025**

2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
  3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
  4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- E. Identify grounding and bonding system components in accordance with Section 26 05 53.
- F. Provide bonding to meet requirements described in Quality Assurance.
- G. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing. Each of branch circuits and feeder circuits shall have dedicated equipment grounding conductor, sharing this conductor with other grounding conductors is not permitted.

### **3.03 FIELD QUALITY CONTROL**

- A. Perform inspection in accordance with Section 01 40 00 Quality Requirements.
- B. Inspect and test in accordance with NETA STD ATS except Section 4.
- C. Perform inspections and tests listed in NETA STD ATS, Section 7.13.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

**END OF SECTION**

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## **SECTION 26 05 29**

### **HANGERS & SUPPORTS FOR ELECTRICAL WORK**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

##### **1.02 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

##### **1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog data for fastening systems.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

##### **1.04 QUALITY ASSURANCE**

- A. Comply with NFPA 70.
- B. Comply with applicable building code.

#### **PART 2 PRODUCTS**

##### **2.01 SUPPORT AND ATTACHMENT COMPONENTS**

- A. General Requirements:
  - 1. Comply with the following. Where requirements differ, comply with most stringent.
    - a. NFPA 70.
    - b. Requirements of authorities having jurisdiction.
  - 2. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
  - 3. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated, where applicable.
  - 4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
  - 5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
  - 6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.

- b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
  - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
  - 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
- D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
  - 1. Comply with MFMA-4.
  - 2. Channel Material:
    - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
    - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
- F. Anchors and Fasteners:
  - 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
  - 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
  - 3. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    - a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
    - b. Comply with MFMA-4.
    - c. Channel Material: Use galvanized steel.

## **2.02 MANUFACTURERS**

- A. Thomas & Betts Corporation or approved equal: [www.tnb.com](http://www.tnb.com).
- B. Threaded Rod Company or approved equal: [www.threadedrod.com](http://www.threadedrod.com).
- C. Substitutions: See Section 01 60 00 - Product Requirements.

## **2.03 MATERIALS**

- A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.
- B. Supports: Fabricated of structural steel or formed steel members; galvanized.
- C. Anchors and Fasteners:
  - 1. Do not use powder-actuated anchors.
  - 2. Concrete Structural Elements: Use precast inserts.
  - 3. Steel Structural Elements: Use beam clamps.
  - 4. Concrete Surfaces: Use self-drilling anchors or expansion anchors.
  - 5. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use hollow wall fasteners.
  - 6. Solid Masonry Walls: Use expansion anchors.
  - 7. Sheet Metal: Use sheet metal screws.
  - 8. Wood Elements: Use wood screws.
- D. Formed Steel Channel:
  - 1. Product: manufactured by [B-Line or approved equal.
  - 2. Substitutions: See Section 01 60 00 - Product Requirements.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.

**Added per Addendum #1 on April 7, 2025**

- B. Install support and attachment components in a neat and workmanlike manner in accordance with NECA 1.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
  - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Remove temporary supports.

**END OF SECTION**

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**SECTION 26 05 33.16**  
**BOXES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
- C. Underground boxes/enclosures.
- D. Pull and junction boxes.

**1.02 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
- E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013.
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. SCTE 77 - Specification for Underground Enclosure Integrity; 2017.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 508A - Industrial Control Panels; 2013.
- L. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
  - 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
  - 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
  - 6. Coordinate the work with other trades to preserve insulation integrity.
  - 7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
  - 8. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground handhole enclosures.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground handhole enclosures.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Keys for Lockable Enclosures: Two of each different key.
- F. Project Record Documents: Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

#### **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.01 BOXES**

- A. General Requirements:
  - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
  - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  - 3. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
  - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
  - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
  - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  - 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
  - 3. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  - 4. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
  - 5. Minimum Box Size, Unless Otherwise Indicated:
    - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.
  - 6. Wall Plates: Comply with Section 26 27 26.
  - 7. Manufacturers:

**Added per Addendum #1 on April 7, 2025**

- a. Cooper Crouse-Hinds, a division of Cooper Industries:  
[www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).
  - b. Hubbell Incorporated; Bell Products: [www.hubbell-bell.com/#sle](http://www.hubbell-bell.com/#sle).
  - c. O-Z/Gedney, a brand of Emerson Industrial Automation:  
[www.emersonindustrial.com/#sle](http://www.emersonindustrial.com/#sle).
  - d. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
  - e. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    - a. Outdoor Locations: Type 3R, painted steel.
  3. Junction and Pull Boxes Larger Than 100 cubic inches:
    - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
    - b. Boxes 6 square feet and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
  4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
    - b. Back Panels: Painted steel, removable.
    - c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
  5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
  6. Manufacturers:
    - a. Cooper B-Line, a division of Cooper Industries: [www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).
    - b. Hoffman, a brand of Pentair Technical Products: [www.hoffmanonline.com/#sle](http://www.hoffmanonline.com/#sle).
    - c. Hubbell Incorporated; Wiegmann Products: [www.hubbell-wiegmann.com/#sle](http://www.hubbell-wiegmann.com/#sle).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
  2. Size: As indicated on drawings.
  3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 24 inches.
  4. Provide logo on cover to indicate type of service.
  5. Applications:
    - a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77, Tier 8 load rating.
    - b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77, Tier 22 load rating.
    - c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
  6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
    - a. Manufacturers:
      - 1) Hubbell Incorporated; Quazite Products: [www.hubbellpowersystems.com/#sle](http://www.hubbellpowersystems.com/#sle).
      - 2) MacLean Highline: [www.macleanhighline.com](http://www.macleanhighline.com).
      - 3) Oldcastle Precast, Inc: [www.oldcastleprecast.com/#sle](http://www.oldcastleprecast.com/#sle).
      - 4) Substitutions: See Section 01 60 00 - Product Requirements.

**2.02 OUTLET BOXES**

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
2. Concrete Ceiling Boxes: Concrete type.
- B. Nonmetallic Outlet Boxes: NEMA OS 2.
- C. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.
- D. Wall Plates for Finished Areas: As specified in Section 26 2726.

## **2.03 PULL AND JUNCTION BOXES**

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Hinged Enclosures: As specified in Section 26 2716.
- C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
  1. Material: Galvanized cast iron; Cast Aluminum.
  2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on drawings.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.
- D. Verify locations of floor boxes and outlets in offices and work areas prior to rough-in.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- E. Box Locations:
  1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.
  2. Unless dimensioned, box locations indicated are approximate.
  3. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 34.
  4. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
    - a. Concealed above accessible suspended ceilings.
    - b. Within joists in areas with no ceiling.
    - c. Electrical rooms.
    - d. Mechanical equipment rooms.
- F. Box Supports:
  1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 Hangers and Supports For Electrical Work using suitable supports and methods approved by the authority having jurisdiction.
  2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in

**Added per Addendum #1 on April 7, 2025**

- accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
- 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
- G. Install boxes plumb and level.
- H. Flush-Mounted Boxes:
  - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
  - 2. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
- I. Install boxes as required to preserve insulation integrity.
- J. Underground Boxes/Enclosures:
  - 1. Install enclosure on gravel base, minimum 6 inches deep.
  - 2. Flush-mount enclosures located in concrete or paved areas.
  - 3. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
- K. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified by the NFPA or authority having jurisdiction.
- L. Close unused box openings.
- M. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- N. Provide grounding and bonding.
- O. Identify boxes in accordance with Section 26 05 53.
- P. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.
- Q. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.
- R. Coordinate installation of outlet boxes for equipment connected.
- S. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
  - 1. Adjust box locations up to 10 feet if required to accommodate intended purpose.
- T. Orient boxes to accommodate wiring devices oriented as specified in Section 26 2726.
- U. Maintain headroom and present neat mechanical appearance.
- V. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- W. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- X. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- Y. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
- Z. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- AA. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- AB. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- AC. Use adjustable steel channel fasteners for hung ceiling outlet box.
- AD. Do not fasten boxes to ceiling support wires.
- AE. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

- AF. Use gang box where more than one device is mounted together. Do not use sectional box.
- AG. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- AH. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

### **3.03 ADJUSTING**

- A. Adjust floor boxes flush with finish flooring material.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused box openings.

### **3.04 CLEANING**

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

### **3.05 PROTECTION**

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

**END OF SECTION**

**SECTION 26 05 34**  
**CONDUIT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Galvanized steel rigid metal conduit (RMC).
- B. Flexible metal conduit (FMC).
- C. Liquidtight flexible metal conduit (LFMC).
- D. Electrical metallic tubing (EMT).
- E. Rigid polyvinyl chloride (PVC) conduit.
- F. Conduit fittings.
- G. Accessories.
- H. Conduit, fittings and conduit bodies.

**1.02 REFERENCE STANDARDS**

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2015.
- C. ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A); 2015.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2003.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- H. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- I. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- J. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
- K. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- L. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- M. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
  - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
  - 5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

#### **1.04 SUBMITTALS**

- A. See Section 01 33 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
- C. Shop Drawings:
  - 1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
  - 2. Include proposed locations of roof penetrations and proposed methods for sealing.
- D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.
- E. Product Data: Provide for metallic conduit and flexible metal conduit.
- F. Samples of Materials Actually Delivered to Site:
  - 1. Two pieces each of conduit, 2 feet long.
- G. Project Record Documents: Accurately record actual routing of conduits larger than 2 inches.

#### **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
- D. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.
- B. Accept conduit on site. Inspect for damage.
- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- D. Protect PVC conduit from sunlight.

### **PART 2 PRODUCTS**

#### **2.01 CONDUIT APPLICATIONS**

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
  - 1. Under Slab on Grade: Use rigid PVC conduit.
  - 2. Exterior, Direct-Buried: Use rigid PVC conduit.
  - 3. Exterior, Embedded Within Concrete: Use rigid PVC conduit.
- D. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).
- E. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).

- F. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.
- G. Exposed, Exterior: Use galvanized steel rigid metal conduit.
- H. Connections to Vibrating Equipment:
  - 1. Dry Locations: Use flexible metal conduit.
  - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
  - 3. Maximum Length: 6 feet unless otherwise indicated.

## **2.02 CONDUIT REQUIREMENTS**

- A. Fittings for Grounding and Bonding: Also comply with Section 26 05 26.
- B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- C. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
- D. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

## **2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

- A. Manufacturers:
  - 1. Allied Tube & Conduit: [www.alliedeg.com/#sle](http://www.alliedeg.com/#sle).
  - 2. Republic Conduit: [www.republic-conduit.com/#sle](http://www.republic-conduit.com/#sle).
  - 3. Wheatland Tube Company: [www.wheatland.com/#sle](http://www.wheatland.com/#sle).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- C. Fittings:
  - 1. Manufacturers:
    - a. Bridgeport Fittings Inc: [www.bptfittings.com/#sle](http://www.bptfittings.com/#sle).
    - b. O-Z/Gedney, a brand of Emerson Industrial Automation: [www.emersonindustrial.com/#sle](http://www.emersonindustrial.com/#sle).
    - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
  - 2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 3. Material: Use steel or malleable iron.
  - 4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

## **2.04 METAL CONDUIT**

- A. Manufacturers:
  - 1. Allied Tube & Conduit: [www.alliedtube.com](http://www.alliedtube.com).
  - 2. Beck Manufacturing, Inc: [www.beckmfg.com](http://www.beckmfg.com).
  - 3. Wheatland Tube Company: [www.wheatland.com](http://www.wheatland.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

## **2.05 FLEXIBLE METAL CONDUIT (FMC)**

- A. Manufacturers:
  - 1. AFC Cable Systems, Inc: [www.afcweb.com/#sle](http://www.afcweb.com/#sle).
  - 2. Electri-Flex Company: [www.electriflex.com/#sle](http://www.electriflex.com/#sle).
  - 3. International Metal Hose: [www.metalhose.com/#sle](http://www.metalhose.com/#sle).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.

- B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- C. Fittings:
  - 1. Manufacturers:
    - a. Bridgeport Fittings Inc: [www.bptfittings.com/#sle](http://www.bptfittings.com/#sle).
    - b. O-Z/Gedney, a brand of Emerson Industrial Automation: [www.emersonindustrial.com/#sle](http://www.emersonindustrial.com/#sle).
    - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
  - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 3. Material: Use steel or malleable iron.
- D. Description: Interlocked steel construction.
- E. Fittings: NEMA FB 1.

## **2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)**

- A. Manufacturers:
  - 1. AFC Cable Systems, Inc: [www.afcweb.com/#sle](http://www.afcweb.com/#sle).
  - 2. Electri-Flex Company: [www.electriflex.com/#sle](http://www.electriflex.com/#sle).
  - 3. International Metal Hose: [www.metalhose.com/#sle](http://www.metalhose.com/#sle).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- C. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.
- D. Description: Interlocked steel construction with PVC jacket.
- E. Fittings: NEMA FB 1.

## **2.07 ELECTRICAL METALLIC TUBING (EMT)**

- A. Manufacturers:
  - 1. Allied Tube & Conduit: [www.alliedeg.com/#sle](http://www.alliedeg.com/#sle).
  - 2. Beck Manufacturing, Inc: [www.beckmfg.com](http://www.beckmfg.com).
  - 3. Wheatland Tube Company: [www.wheatland.com/#sle](http://www.wheatland.com/#sle).
- B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- C. Fittings:
  - 1. Manufacturers:
    - a. Bridgeport Fittings Inc: [www.bptfittings.com/#sle](http://www.bptfittings.com/#sle).
    - b. O-Z/Gedney, a brand of Emerson Industrial Automation: [www.emersonindustrial.com/#sle](http://www.emersonindustrial.com/#sle).
    - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
  - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 3. Material: Use steel or malleable iron.
  - 4. Connectors and Couplings: Use compression (gland) or set-screw type.
    - a. Do not use indenter type connectors and couplings.
- D. Fittings and Conduit Bodies: NEMA FB 1; steel set screw type.

## **2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT**

- A. Manufacturers:
  - 1. Cantex Inc: [www.cantexinc.com/#sle](http://www.cantexinc.com/#sle).
  - 2. Carlon, a brand of Thomas & Betts Corporation: [www.carlon.com/#sle](http://www.carlon.com/#sle).
  - 3. AFC Cable Systems, Inc: [www.afcweb.com](http://www.afcweb.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- C. Fittings:
  - 1. Manufacturer: Same as manufacturer of conduit to be connected.
  - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.
- D. Description: NEMA TC 2; Schedule 40 PVC.
- E. Fittings and Conduit Bodies: NEMA TC 3.

## **2.09 ACCESSORIES**

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil.
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.
- E. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
- F. Description: NEMA TC 2.
- G. Fittings and Conduit Bodies: NEMA TC 3.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on drawings.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.
- D. Verify routing and termination locations of conduit prior to rough-in.
- E. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- E. Conduit Routing:
  - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
  - 2. When conduit destination is indicated and routing is not shown, determine exact routing required.
  - 3. Conceal all conduits unless specifically indicated to be exposed.
  - 4. Conduits in the following areas may be exposed, unless otherwise indicated:

- a. Electrical rooms.
- b. Mechanical equipment rooms.
- c. Within joists in areas with no ceiling.
5. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
6. Arrange conduit to maintain adequate headroom, clearances, and access.
7. Arrange conduit to provide no more than 150 feet between pull points.
8. Route conduits above water and drain piping where possible.
9. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
10. Group parallel conduits in the same area together on a common rack.
- F. Conduit Support:
  1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
  2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
  3. Use of wire for support of conduits is not permitted.
- G. Connections and Terminations:
  1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
  2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
  3. Use suitable adapters where required to transition from one type of conduit to another.
  4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
  5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
  6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
  7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- H. Penetrations:
  1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
  2. Make penetrations perpendicular to surfaces unless otherwise indicated.
  3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
  4. Conceal bends for conduit risers emerging above ground.
  5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
  6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
  7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
  8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- I. Underground Installation:
  1. Provide trenching and backfilling\_\_\_\_\_.

**Added per Addendum #1 on April 7, 2025**

2. Minimum Cover, Unless Otherwise Indicated or Required:
  - a. Underground, Exterior: 24 inches.
3. Provide underground warning tape in accordance with Section 26 05 53 along entire conduit length.
- J. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 30 00 with minimum concrete cover of 3 inches on all sides unless otherwise indicated.
- K. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
  1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
  2. Where conduits are subject to earth movement by settlement or frost.
- L. Conduit Sealing:
  1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
    - a. Where conduits enter building from outside.
    - b. Where service conduits enter building from underground distribution system.
    - c. Where conduits enter building from underground.
    - d. Where conduits may transport moisture to contact live parts.
  2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
    - a. Where conduits pass from outdoors into conditioned interior spaces.
    - b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- M. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
  1. Where conduits pass from outdoors into conditioned interior spaces.
  2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- N. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.
- O. Provide grounding and bonding in accordance with Section 26 05 26.
- P. Identify conduits in accordance with Section 26 05 53.

**3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective conduits.

**3.04 CLEANING**

- A. Clean interior of conduits to remove moisture and foreign matter.

**3.05 PROTECTION**

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.
- B. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 1.
- C. Install steel conduit as specified in NECA 101.
- D. Install nonmetallic conduit in accordance with manufacturer's instructions.

- E. Arrange supports to prevent misalignment during wiring installation.
- F. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- G. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- H. Fasten conduit supports to building structure and surfaces under provisions of Section 26 0529.
- I. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- J. Do not attach conduit to ceiling support wires.
- K. Arrange conduit to maintain headroom and present neat appearance.
- L. Route exposed conduit parallel and perpendicular to walls.
- M. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- N. Route conduit in and under slab from point-to-point.
- O. Do not cross conduits in slab.
- P. Maintain adequate clearance between conduit and piping.
- Q. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
- R. Cut conduit square using saw or pipecutter; de-burr cut ends.
- S. Bring conduit to shoulder of fittings; fasten securely.
- T. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- U. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- V. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one shot bender to fabricate bends in metal conduit larger than 2 inch size.
- W. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- X. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control, and expansion joints.
- Y. Provide suitable pull string in each empty conduit except sleeves and nipples.
- Z. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- AA. Ground and bond conduit under provisions of Section 26 0526.
- AB. Identify conduit under provisions of Section 26 0553.

### **3.06 INTERFACE WITH OTHER PRODUCTS**

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

#### **END OF SECTION**

**SECTION 26 05 53**  
**IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Underground warning tape.
- F. Warning signs and labels.
- G. Field-painted identification of conduit.

**1.02 REFERENCE STANDARDS**

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
  - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
  - 2. Do not install identification products until final surface finishes and painting are complete.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide catalog data for nameplates, labels, and markers.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

**1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

**1.06 EXTRA MATERIALS**

- A. See Section 01 60 00 - Product Requirements for additional requirements.

**PART 2 PRODUCTS**

**2.01 IDENTIFICATION REQUIREMENTS**

- A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
- B. Identification for Equipment:
  - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    - a. Panelboards:
      - 1) Identify ampere rating.

- 2) Identify voltage and phase.
  - 3) Identify power source and circuit number. Include location when not within sight of equipment.
  - 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
  - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
  - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
2. Service Equipment:
    - a. Use identification nameplate to identify each service disconnecting means.
    - b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
    - c. Use identification nameplate at each piece of service equipment to identify the available fault current and the date calculations were performed.
  3. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
- C. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19 LV Power Conductors & Cables
  2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
  3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
    - a. At each source and load connection.
    - b. Within boxes when more than one circuit is present.
    - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
- D. Identification for Raceways:
1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
  2. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet.
    - a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.
      - 1) Color Code:
      - 2) Field-Painting: Comply with Section 09 90 00 Painting and Coating
      - 3) Vinyl Color Coding Electrical Tape: Comply with Section 26 05 19 LV Power Conductors & Cables
  3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
- E. Identification for Boxes:
1. Use voltage markers to identify highest voltage present.
  2. Use voltage markers or color coded boxes to identify systems other than normal power system.

**Added per Addendum #1 on April 7, 2025**

- a. Color-Coded Boxes: Field-painted in accordance with Section 09 90 00 per the same color code used for raceways.
      - 1) Emergency Power System: Red.
  - 3. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
    - a. For exposed boxes in public areas, use only identification labels.
- F. Identification for Devices:
- 1. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.

## **2.02 MANUFACTURERS**

- A. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
- B. Seton Identification Products: [www.seton.com/aec](http://www.seton.com/aec).
- C. HellermannTyton: [www.hellermannntyton.com](http://www.hellermannntyton.com).
- D. Substitutions: See Section 01 60 00 - Product Requirements.

## **2.03 IDENTIFICATION NAMEPLATES AND LABELS**

- A. Identification Nameplates:
  - 1. Manufacturers:
    - a. Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
    - b. Kolbi Pipe Marker Co: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
    - c. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
  - 2. Materials:
    - a. Indoor Clean, Dry Locations: Use plastic nameplates.
    - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
  - 3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
    - a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.
  - 4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
  - 5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
  - 6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.
- B. Identification Labels:
  - 1. Manufacturers:
    - a. Brady Corporation: [www.bradyid.com/#sle](http://www.bradyid.com/#sle).
    - b. Brother International Corporation: [www.brother-usa.com/#sle](http://www.brother-usa.com/#sle).
    - c. Panduit Corp: [www.panduit.com/#sle](http://www.panduit.com/#sle).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
  - 2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
    - a. Use only for indoor locations.
  - 3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for General Information and Operating Instructions:
  - 1. Minimum Size: 1 inch by 2.5 inches.
  - 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.

3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/4 inch.
5. Color: Black text on white background unless otherwise indicated.
- D. Format for Control Device Identification:
  1. Minimum Size: 3/8 inch by 1.5 inches.
  2. Legend: Load controlled or other designation indicated.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 3/16 inch.
  5. Color: Black text on clear background.
- E. Nameplates: Engraved three-layer laminated plastic, black letters on white background.
- F. Locations:
  1. Each electrical distribution and control equipment enclosure.
- G. Letter Size:
  1. Use 1/8 inch letters for identifying individual equipment and loads.
  2. Use 1/4 inch letters for identifying grouped equipment and loads.

## **2.04 WIRE AND CABLE MARKERS**

- A. Manufacturers:
  1. Brady Corporation: [www.bradyid.com/#sle](http://www.bradyid.com/#sle).
  2. HellermannTyton: [www.hellermannntyton.com/#sle](http://www.hellermannntyton.com/#sle).
  3. Panduit Corp: [www.panduit.com/#sle](http://www.panduit.com/#sle).
  4. Panduit Corp.
  5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- D. Legend: Power source and circuit number or other designation indicated.
- E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- F. Minimum Text Height: 1/8 inch.
- G. Color: Black text on white background unless otherwise indicated.
- H. Description: split sleeve type wire markers.
- I. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, and junction boxes each load connection.
- J. Legend:
  1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
  2. Control Circuits: Control wire number indicated on shop drawings.

## **2.05 VOLTAGE MARKERS**

- A. Manufacturers: Panduit Corp or approved equal.
  1. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- D. Minimum Size:
  1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
  2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.

**Added per Addendum #1 on April 7, 2025**

- 3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
- 4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.
- E. Legend:
  - 1. Markers for Voltage Identification: Highest voltage present.
  - 2. Markers for System Identification:
- F. Color: Black text on orange background unless otherwise indicated.
- G. Location: Furnish markers for each conduit longer than 6 feet.
- H. Spacing: 20 feet on center.
- I. Color:
  - 1. 480 Volt System: Brown.
  - 2. 208 Volt System: Yellow.
  - 3. Fire Alarm System: Red.
- J. Legend:
  - 1. 480 Volt System: brown.
  - 2. 208 Volt System: yellow.
  - 3. Fire Alarm System: red.

**2.06 UNDERGROUND WARNING TAPE**

- A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.
- C. Legend: Type of service, continuously repeated over full length of tape.
- D. Color:
  - 1. Tape for Buried Power Lines: Black text on red background.

**2.07 WARNING SIGNS AND LABELS**

- A. Manufacturers:
  - 1. Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
  - 2. Clarion Safety Systems, LLC: [www.clarionsafety.com/#sle](http://www.clarionsafety.com/#sle).
  - 3. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- C. Warning Signs:
  - 1. Materials:
    - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
    - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
  - 2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
  - 3. Minimum Size: 7 by 10 inches unless otherwise indicated.
- D. Warning Labels:
  - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
    - a. Do not use labels designed to be completed using handwritten text.
    - b. Provide polyester overlamine to protect handwritten text.
  - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
  - 3. Minimum Size: 2 by 4 inches unless otherwise indicated.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.
- B. Degrease and clean surfaces to receive nameplates and labels.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
  - 1. Surface-Mounted Equipment: Enclosure front.
  - 2. Flush-Mounted Equipment: Inside of equipment door.
  - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
  - 4. Elevated Equipment: Legible from the floor or working platform.
  - 5. Branch Devices: Adjacent to device.
  - 6. Interior Components: Legible from the point of access.
  - 7. Conduits: Legible from the floor.
  - 8. Boxes: Outside face of cover.
  - 9. Conductors and Cables: Legible from the point of access.
  - 10. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.
- G. Secure rigid signs using stainless steel screws.
- H. Mark all handwritten text, where permitted, to be neat and legible.

### **END OF SECTION**

**SECTION 26 09 23**  
**LIGHTING CONTROL DEVICES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Timeclocks.
- B. Outdoor photo controls.

**1.02 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

**1.05 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

**1.06 DELIVERY, STORAGE, AND PROTECTION**

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

**1.07 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

**1.08 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

**PART 2 PRODUCTS**

**2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS**

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

**2.02 TIMECLOCKS**

- A. Manufacturers:
  - 1. Intermatic, Inc; or approved equal: [www.intermatic.com/#sle](http://www.intermatic.com/#sle).

2. Tork, a division of NSI Industries LLC; or approved equal: [www.tork.com/#sle](http://www.tork.com/#sle).
  3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Digital Timeclocks:
1. Description: Multipurpose timer for automatic control of outdoor loads.
  2. Housing: Outdoor, NEMA-3R rated.
  3. Input:
    - a. 120/277V power input.
    - b. Photosensor control input for additional control of loads.
  4. Output: 120/277V output. Where connected to a contactor, the output voltage shall match the required input voltage of the contactor coil.
  5. Scheduling:
    - a. Astronomical adjustment for daily sunrise and sunset times.
    - b. On and off setpoints for each day of the week.
    - c. Automatic adjustment for daylight saving.
  6. Backup power: Battery backup for schedule settings to be retained for up to (7) days.

### **2.03 OUTDOOR PHOTO CONTROLS**

- A. Manufacturers:
1. Intermatic, Inc; or approved equal: [www.intermatic.com/#sle](http://www.intermatic.com/#sle).
  2. Tork, a division of NSI Industries LLC; or approved equal: [www.tork.com/#sle](http://www.tork.com/#sle).
  3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Stem-Mounted Outdoor Photo Controls:
1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
  2. Housing: Weatherproof, impact resistant polycarbonate.
  3. Photo Sensor: Cadmium sulfide.
  4. Provide external sliding shield for field adjustment of light level activation.
  5. Light Level Activation: 1 to 5 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
  6. Voltage: As required to control the load indicated on the drawings.
  7. Failure Mode: Fails to the on position.
  8. Load Rating: As required to control the load indicated on the drawings.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### **3.03 INSTALLATION**

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of lighting control devices provided under this section.
- C. Install lighting control devices in accordance with manufacturer's instructions.
- D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- E. Install lighting control devices plumb and level, and held securely in place.
- F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 27 26.
- G. Provide required supports in accordance with Section 26 05 29.
- H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- I. Outdoor Photo Control Locations:
  - 1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
  - 2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.
- J. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each lighting control device for damage and defects.
- C. Test outdoor photo controls to verify proper operation, including time delays where applicable.
- D. Correct wiring deficiencies and replace damaged or defective lighting control devices.

### **3.05 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.

### **3.06 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

**END OF SECTION**

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**SECTION 26 22 00**  
**LOW-VOLTAGE TRANSFORMERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General purpose transformers.

**1.02 REFERENCE STANDARDS**

- A. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.
- B. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers; 2013.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.
- E. NEMA ST 1 - Specialty Transformers (Except General Purpose Type); National Electrical Manufacturers Association; 1988 (R1997).
- F. NEMA ST 20 - Dry-Type Transformers for General Applications; 2014.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.
- K. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate the work with placement of support framing and anchors required for mounting of transformers.
- B. NEMA TR-1/ANSI 57.12.51 and 57.12.50
- C. Federal Register - US department of Energy, Office of Energy Efficiency and Renewable Energy, 10 CFR Part 30, July 29, 2004. Energy Conservation Program for Commercial and Industrial Equipment, Energy Conservation Standards for Distribution Transformers, Proposed Rule.
- D. ANSI/ASHRAE/IESNA 90.1 - Energy Efficient Design on New Buildings Except Low- Rise Residential Buildings.
  - 1. Transformer selection based on optimizing the combination of no-load, part-load, and full-load losses without compromising operational and reliability requirements for the building.
- E. ANSI/NEMA TP-1 - Guide for Determining Energy Efficiency for Distribution Transformers.
  - 1. For Reference only. US DOE does not consider NEMA TP-1 efficiency levels to reflect low life cycle cost.
- F. ANSI/NEMA TP-2 - Standard Test Method for Measuring Energy Consumption of Distribution Transformers.
- G. IEEE C57.110-1998 - IEEE Recommended Practice for establishing transformer capability when feeding nonsinusoidal load currents.
  - 1. Transformers losses increase in proportion to the mix of electronic equipment in the overall load fed from transformer.

#### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.
- C. Provide linear load efficiency data at 25 %, 35%, 50 %, 75 % , and 100 % full load.
  - 1. Vibration Isolators: Include attachment method and rated load and deflection.
- D. Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.
- E. Product Data: Provide outline and support point dimensions of enclosures and accessories, unit weight, voltage, kVA, and impedance ratings and characteristics, tap configurations, insulation system type, core and coil material and rated temperature rise.
- F. Test Reports: Indicate loss data, efficiency at 0, 25, 50, 75 and 100 percent rated load, and sound level.
- G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- H. Maintenance Data: Include recommended maintenance procedures and intervals.
- I. Project Record Documents: Record actual locations of transformers.

#### **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
- E. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

#### **1.07 FIELD CONDITIONS**

- A. Ambient Temperature: Do not exceed the following maximum temperatures during and after installation of transformers.
  - 1. Greater than 10 kVA: 104 degrees F maximum.
  - 2. Less than 10 kVA: 77 degrees F maximum.
- B. Ambient Temperature: Do not exceed 86 degrees F average or 104 degrees F maximum measured during any 24 hour period during and after installation of transformers.

#### **1.08 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. 5 year warranty on all transformers and appurtenances.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Schneider Electric; Square D Products; Premium 30 energy efficient: [www.schneider-electric.us/#sle](http://www.schneider-electric.us/#sle).
- B. Eaton Electrical/Cutler-Hammer: [www.eatonelectrical.com](http://www.eatonelectrical.com).
- C. GE Industrial: [www.geindustrial.com](http://www.geindustrial.com).
- D. Powersmiths International Corp.
- E. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Source Limitations: Furnish transformers produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

### **2.02 ALL TRANSFORMERS**

- A. Description: High performance, energy efficient, copper wound transformer with 30 % less losses than NEMA TP\_1 . Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
  - 1. Altitude: Less than 3,300 feet.
  - 2. Ambient Temperature:
    - a. Greater than 10 kVA: Not exceeding 104 degrees F.
    - b. Less than 10 kVA: Not exceeding 77 degrees F.
  - 3. Ambient Temperature: Not exceeding 86 degrees F average or 104 degrees F maximum measured during any 24 hour period.
- C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.
- D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.
- E. Basic Impulse Level: 10 kV.
- F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- G. Isolate core and coil from enclosure using vibration-absorbing mounts.
- H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

### **2.03 GENERAL PURPOSE TRANSFORMERS**

- A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.
- B. Primary Voltage: 480 volts delta, 3 phase.
- C. Secondary Voltage: 208Y/120 volts, 3 phase 4 wire.
- D. Insulation System and Allowable Average Winding Temperature Rise:
  - 1. 15 kVA and Larger: Class 220 degrees C insulation system with 115 degrees C average winding temperature rise.
- E. Coil Conductors: Continuous copper windings with terminations brazed or welded.
- F. Winding Taps:
  - 1. Less than 3 kVA: None.

2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.
  3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
  4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.
- G. Energy Efficiency: DOE 2016 energy efficiency levels.
- H. Sound Levels: Low sound levels at least 5 db less than NEMA ST 20 standard sound levels.
- I. Mounting Provisions:
1. Less than 15 kVA: Suitable for wall mounting.
  2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
  3. Larger than 75 kVA: Suitable for floor mounting.
- J. Transformer Enclosure: Comply with NEMA ST 20.
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor clean, dry locations: Type 2.
  2. Construction: Heavy gage steel.
    - a. Less than 15 kVA: Totally enclosed, non-ventilated.
    - b. 15 kVA and Larger: Ventilated.
  3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
  4. Provide lifting eyes or brackets.
- K. Accessories:
1. Lug Kits: Sized as required for termination of conductors as indicated on the drawings.
- L. Primary Voltage: 480 volts, 3 phase.
- M. Secondary Voltage: 208Y/120 volts, 3 phase.
- N. Insulation system and average winding temperature rise for rated kVA as follows:
1. 1-15 kVA: Class 185 with 115 degrees C rise, in a 40 C ambient setting.
  2. 16-500 kVA: Class 220 with 115 degrees C rise, in a 40 C ambient setting.
- O. Case Temperature: Do not exceed 35 degrees C rise above ambient at warmest point at full load.
- P. Winding Taps:
1. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.
  2. Transformers 15 kVA and Larger: Two 2-1/2% full capacity taps above and below normal primary voltage.
- Q. Sound Levels: NEMA ST 20.
- R. Energy Standard
1. Efficiency at 50% load is at least 0.9% higher than NEMA TP-1 for transformers up to 750 KVA.
- S. Basic Impulse Level: 10 kV
- T. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- U. Mounting:
1. 1-15 kVA: Suitable for wall mounting.
  2. 16-75 kVA: Suitable for wall mounting.
  3. Larger than 75 kVA: Suitable for floor mounting.
- V. Coil Conductors: Continuous copper windings with terminations brazed or welded.
- W. Transformer Enclosure: NEMA ST 20.
1. Type 3R where located outdoors.

- 2. Ventilated.
- 3. Provide lifting eyes or brackets.
- 4. All terminals, including those for changing taps, must be readily accessible by removing front cover plates.
- X. Isolate core and coil from enclosure using vibration-absorbing mounts.
- Y. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.

## **2.04 SOURCE QUALITY CONTROL**

- A. Factory test transformers according to NEMA ST 20.
- B. Production test each unit according to NEMA ST 20.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.
- C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.
- D. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1.
- B. Install transformers in accordance with manufacturer's instructions.
- C. Install transformers in accordance with NECA 409 and IEEE C57.94.
- D. Use flexible conduit, under the provisions of Section 26 05 34, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
- E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.
- F. Set transformers plumb and level.
- G. Use flexible conduit, under the provisions of Section 26 0534, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
- H. Mount wall-mounted transformers using integral flanges or accessory brackets furnished by the manufacturer.
- I. Mount floor-mounted transformers on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.
- J. Mount floor-mounted transformers using vibration isolators suitable for isolating the transformer noise from the building structure.
- K. Mount floor-mounted transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure.
- L. Mount trapeze-mounted transformers as indicated.
- M. Provide seismic restraints.
- N. Provide grounding and bonding in accordance with Section 26 05 26.
- O. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.
- P. Where not factory-installed, install lugs sized as required for termination of conductors as shown on the drawings.

- Q. Identify transformers in accordance with Section 26 05 53.
- R. Install transformer identification nameplate in accordance with Section 26 0553.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Perform field inspection, testing, and adjusting in accordance with Section 01 40 00.
- C. Inspect and test in accordance with NETA STD ATS, except Section 4.
- D. Perform inspections and tests listed in NETA STD ATS, Section 7.2.1.1. In addition to the basic requirements of Section 7.2, include the following:
  - 1. Perform turns ratio tests at all tap positions.
  - 2. Verification that as-left tap connections are as specified.
  - 3. Perform excitation-current tests on each phase.
  - 4. Measure the resistance of each winding at each tap connection.
  - 5. Overpotential test on all high- and low-voltage windings-to-ground.

### **3.04 ADJUSTING**

- A. Measure primary and secondary voltages and make appropriate tap adjustments.
- B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

### **3.05 CLEANING**

- A. Clean dirt and debris from transformer components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

**SECTION 26 24 16**  
**PANELBOARDS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Lighting and appliance panelboards.
- B. Overcurrent protective devices for panelboards.

**1.02 REFERENCE STANDARDS**

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).
- F. NEMA PB 1 - Panelboards; 2011.
- G. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.
- H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- L. UL 67 - Panelboards; Current Edition, Including All Revisions.
- M. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- N. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
  - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
  - 1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
  - 1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
  - 2. Include wiring diagrams showing all factory and field connections.
  - 3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Panelboard Keys: Two of each different key.

#### **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

#### **1.07 FIELD CONDITIONS**

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
  - 1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Basis of design: Schneider Electric; Square D Products: [www.schneider-electric.us](http://www.schneider-electric.us).
- B. General Electric Company: [www.geindustrial.com](http://www.geindustrial.com).

- C. Eaton Corporation: [www.eaton.com](http://www.eaton.com).
- D. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

## **2.02 PANELBOARDS - GENERAL REQUIREMENTS**

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet.
  - 2. Ambient Temperature:
    - a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
- C. Short Circuit Current Rating:
  - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
  - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
  - 2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
    - b. Outdoor Locations: Type 3R.
  - 2. Boxes: Galvanized steel unless otherwise indicated.
    - a. Provide wiring gutters sized to accommodate the conductors to be installed.
    - b. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
  - 3. Fronts:
    - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
    - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
    - c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
  - 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- J. Panelboard Contactors: Where panelboard contactors are indicated, provide electrically operated, mechanically held magnetic contactor complying with NEMA ICS 2.
  - 1. Ampere Rating: Not less than ampere rating of panelboard bus unless noted otherwise.
  - 2. Short Circuit Current Rating: Not less than the panelboard short circuit current rating.
  - 3. Coil Voltage: As required for connection to control system indicated.

### **2.03 LIGHTING AND APPLIANCE PANELBOARDS**

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  - 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
  - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
  - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
  - 2. Phase and Neutral Bus Material: Copper.
  - 3. Ground Bus Material: Copper.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
  - 1. Provide surface-mounted or flush-mounted enclosures as indicated.
  - 2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
  - 3. Provide metal circuit directory holder mounted on inside of door.

### **2.04 OVERCURRENT PROTECTIVE DEVICES**

- A. Molded Case Circuit Breakers:
  - 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
  - 2. Interrupting Capacity:
    - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      - 1) 14000 rms symmetrical amperes at 240 VAC or 208 VAC.
      - 2) 22000 rms symmetrical amperes at 480 VAC.
    - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
  - 3. Conductor Terminations:
    - a. Provide mechanical lugs unless otherwise indicated.
    - b. Lug Material: Copper, suitable for terminating copper conductors only.
  - 4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
    - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
    - b. Provide interchangeable trip units for circuit breaker frame sizes 400 amperes and larger.
  - 5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
  - 6. Provide the following circuit breaker types where indicated:
    - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
  - 7. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
  - 8. Do not use tandem circuit breakers.
  - 9. Do not use handle ties in lieu of multi-pole circuit breakers.

### **2.05 SOURCE QUALITY CONTROL**

- A. Factory test panelboards according to NEMA PB 1.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required supports in accordance with Section 26 05 29.
- F. Install panelboards plumb.
- G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- I. Mount floor-mounted power distribution panelboards on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.
- J. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- K. Provide grounding and bonding in accordance with Section 26 05 26.
  - 1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
- L. Install all field-installed branch devices, components, and accessories.
- M. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- N. Set field-adjustable circuit breaker tripping function settings as indicated.
- O. Provide filler plates to cover unused spaces in panelboards.
- P. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
  - 1. Emergency and night lighting circuits.
  - 2. Fire detection and alarm circuits.
  - 3. Intrusion detection and access control system circuits.
  - 4. Video surveillance system circuits.
- Q. Identify panelboards in accordance with Section 26 05 53 Identification for Electrical Systems.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Test GFCI circuit breakers to verify proper operation.
- D. Correct deficiencies and replace damaged or defective panelboards or associated components.

### **3.04 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

### **3.05 CLEANING**

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

**SECTION 26 27 26**  
**WIRING DEVICES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Wall switches.

**1.02 REFERENCE STANDARDS**

- A. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); 2017g.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- D. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).
- E. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- H. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
  - 3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
  - 4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- C. Project Record Documents: Record actual installed locations of wiring devices.

**1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories Inc. or testing firm acceptable to authorities having jurisdiction as suitable for the purpose specified and indicated.

**1.06 DELIVERY, STORAGE, AND PROTECTION**

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Hubbell Incorporated: [www.hubbell-wiring.com](http://www.hubbell-wiring.com).
- B. Leviton Manufacturing Company, Inc: [www.leviton.com](http://www.leviton.com).
- C. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us](http://www.legrand.us)
- D. Substitutions: See Section 01 60 00 - Product Requirements.

- E. Source Limitations: Where possible, for each type of wiring device furnish products produced by a single manufacturer and obtained from a single supplier.

## **2.02 WIRING DEVICE APPLICATIONS**

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

## **2.03 WIRING DEVICE FINISHES:**

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices, Unless Otherwise Indicated: White with standard stainless steel wall plate.

## **2.04 WALL SWITCHES**

- A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

## **2.05 WALL PLATES**

- A. Manufacturers:
  - 1. Hubbell Incorporated: [www.hubbell-wiring.com/#sle](http://www.hubbell-wiring.com/#sle).
  - 2. Leviton Manufacturing Company, Inc: [www.leviton.com/#sle](http://www.leviton.com/#sle).
  - 3. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us/#sle](http://www.legrand.us/#sle).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Wall Plates: Comply with UL 514D.
  - 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
  - 2. Size: Standard; US.
  - 3. Screws: Metal with slotted heads finished to match wall plate finish.
- C. Weatherproof Covers for Wet Locations: Gasketed, thermoplastic, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

# **PART 3 EXECUTION**

## **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

## **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### **3.03 INSTALLATION**

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 05 37 Boxes as required for installation of wiring devices provided under this section.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Provide GFI receptacles with integral GFI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- I. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- J. Install wall switches with OFF position down.
- K. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- L. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- M. Identify wiring devices in accordance with Section 26 05 53 Identification for Electrical Systems

### **3.04 FIELD QUALITY CONTROL**

- A. Perform field inspection, testing, and adjusting in accordance with Section 01 40 00 Quality Requirements.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Correct wiring deficiencies and replace damaged or defective wiring devices.

### **3.05 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.

### **3.06 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

**END OF SECTION**

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**SECTION 26 56 00**  
**EXTERIOR LIGHTING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Exterior luminaires.
- B. Poles and accessories.
- C. Luminaire accessories.

**1.02 REFERENCE STANDARDS**

- A. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signal; 2013 (Revised 2015).
- B. ANSI O5.1 - American National Standard for Wood Poles -- Specifications and Dimensions; 2017.
- C. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).
- D. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.
- E. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; 2015, with Errata (2017).
- F. IESNA LM-64 - Photometric Measurements of Parking Areas; 2001 (Reaffirmed 2007).
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- H. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- K. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
  - 2. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements and Section 01 33 00 - Submittal Procedures, for submittal procedures.
- B. Shop Drawings:
  - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
  - 2. Provide photometric calculations where luminaires are proposed for substitution .
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
  - 1. LED Luminaires:

- a. Include estimated useful life, calculated based on IES LM-80 test data.
2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IESNA LM-63 standard format upon request.
3. Lamps: Include rated life and initial and mean lumen output.
4. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.
- D. Sustainable Design Documentation: Submit manufacturer's product data on lamp mercury content and rated lamp life, showing compliance with specified requirements.
- E. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- G. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Section 01 60 00 - Product Requirements, for additional provisions.
- I. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

#### **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.
- C. Receive, handle, and store wood poles in accordance with ANSI O5.1.

#### **1.07 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

### **PART 2 PRODUCTS**

#### **2.01 LUMINAIRE TYPES**

- A. Furnish products as indicated in luminaire schedule included on the Drawings.
- B. Substitutions: See Section 01 60 00 - Product Requirements.

#### **2.02 LUMINAIRES**

- A. Manufacturers:
  1. Basis of design: EXO Outdoor Lighting; [www.currentlighting.com/exo](http://www.currentlighting.com/exo).
  2. Acuity Brands, Inc; : [www.acuitybrands.com/#sle](http://www.acuitybrands.com/#sle).
  3. Hubbell Lighting, Inc; : [www.hubbelllighting.com/#sle](http://www.hubbelllighting.com/#sle).
  4. Philips Lighting North America Corporation; [www.lightingproducts.philips.com/#sle](http://www.lightingproducts.philips.com/#sle).
  5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Provide products that comply with requirements of NFPA 70.

**Added per Addendum #1 on April 7, 2025**

- C. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- D. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- H. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.
- I. LED Luminaires:
  - 1. Components: UL 8750 recognized or listed as applicable.
  - 2. Tested in accordance with IES LM-79 and IES LM-80.
  - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
- J. LED Luminaires: Listed and labeled as complying with UL 8750.
- K. Exposed Hardware: Stainless steel.

**2.03 POLES**

- A. Manufacturers:
  - 1. Acuity Brands, Inc; or approved equal: [www.acuitybrands.com/#sle](http://www.acuitybrands.com/#sle).
  - 2. Hubbell Lighting, Inc; or approved equal: [www.hubbellighting.com/#sle](http://www.hubbellighting.com/#sle).
  - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. All Poles:
  - 1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
  - 2. Structural Design Criteria:
    - a. Comply with AASHTO LTS.
    - b. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.
      - 1) Design Wind Speed: 100 miles per hour, with gust factor of 1.3.
    - c. Dead Load: Include weight of proposed luminaire(s) and associated supports and accessories.
  - 3. Material: Steel, unless otherwise indicated.
  - 4. Shape: Square straight, unless otherwise indicated.
  - 5. Finish: Match luminaire finish, unless otherwise indicated.
  - 6. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
  - 7. Unless otherwise indicated, provide with the following features/accessories:
    - a. Top cap and metallic base cover.
    - b. Handhole.
    - c. Anchor bolts with leveling nuts or leveling shims.
    - d. Anchor base cover.
    - e. Pole-top tenon, size as required for installed luminaire or bracket.
- C. Metal Poles: Provide ground lug, accessible from handhole or transformer base.

**2.04 ACCESSORIES**

- A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

- B. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### **3.03 INSTALLATION**

- A. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of luminaires provided under this section.
- B. Install products according to manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship) and NECA/IESNA 501 (exterior lighting).
- D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- E. Install accessories furnished with each luminaire.
- F. Bond products and metal accessories to branch circuit equipment grounding conductor.
- G. Install lamps in each luminaire.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

### **3.05 ADJUSTING**

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

### **3.06 CLEANING**

- A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

### **3.07 CLOSEOUT ACTIVITIES**

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.
- D. Just prior to Substantial Completion, replace all lamps that have failed.

**3.08 PROTECTION**

- A. Protect installed luminaires from subsequent construction operations.

**END OF SECTION**

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## **SECTION 33 71 19**

### **ELECTRICAL UNDERGROUND DUCTS, DUCTBANKS, AND MANHOLES**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Conduit and duct:
  - 1. Rigid polyvinyl chloride (PVC) conduit.
- B. Accessories:
  - 1. Underground warning tape.
  - 2. Accessories for utility boxes and handholes.

##### **1.02 REFERENCE STANDARDS**

- A. ASTM C891 - Standard Practice for Installation of Underground Precast Concrete Utility Structures.
- B. ASTM F512 - Standard Specification for Smooth-Wall Poly(Vinyl Chloride) (PVC) Conduit and Fittings for Underground Installation; 2012 (Reapproved 2017).
- C. IEEE C2 - National Electrical Safety Code; 2017.
- D. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.
- E. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2016.
- F. NEMA TC 6&8 - Polyvinyl Chloride (PVC) Plastic Utilities for Underground Installations; 2013.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

##### **1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide for metallic conduit, nonmetallic conduit, and manhole accessories.
- C. Shop Drawings: Indicate dimensions, reinforcement, size and locations of openings, and accessory locations for in-grade utility boxes.
- D. Project Record Documents: Record actual routing and elevations of underground conduit and duct, and locations and sizes of in-grade utility boxes.

##### **1.04 FIELD CONDITIONS**

- A. Interruption of Existing Electrical Service; Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions, and then only after arranging to provide temporary electrical service according to requirements indicated:
  - 1. Notify Owner no fewer than two days in advance of proposed interruption of electrical service.
  - 2. Do not proceed with interruption of electrical service without Owners written permission.
- B. Ground Water: Assume ground-water level is 18 inches (900MM) below ground surface unless a higher water table is noted on Drawings.

#### **PART 2 PRODUCTS**

##### **2.01 CONDUIT AND DUCT**

- A. Rigid Polyvinyl Chloride (PVC) Conduit: NFPA 70, Type PVC; comply with NEMA TC 2 and list and label as complying with UL 651; Schedule 40 unless otherwise indicated; rated for use with conductors rated 90 degrees C.
  - 1. Manufacturers:
    - a. Cantex Inc: [www.cantexinc.com](http://www.cantexinc.com).

- b. Carlon, a brand of Thomas & Betts Corporation: [www.carlon.com](http://www.carlon.com).
- c. JM Eagle: [www.jmeagle.com](http://www.jmeagle.com).
- 2. Fittings: Comply with NEMA TC 3 and list and label as complying with UL 651.
  - a. Manufacturer: Same as manufacturer of conduit to be connected.

## **2.02 ACCESSORIES**

- A. Underground Warning Tape: Non-Biodegradable Polyethylene tape suitable for direct burial.
  - 1. Manufacturers:
    - a. Brady Corporation: [www.bradyid.com](http://www.bradyid.com).
    - b. Brimar Industries, Inc: [www.brimar.com](http://www.brimar.com).
    - c. Seton Identification Products: [www.seton.com](http://www.seton.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
  - 2. Foil-backed Detectable Type Tape: 4 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.
  - 3. Legend: Type of service, continuously repeated over full length of tape.
  - 4. Color:
    - a. Tape for Buried Power Lines: Black text on red background.
    - b. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.
  - 5. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and size of ducts with which used, and selected to provide minimum duct spacing indicated while supporting ducts during concreting or backfilling.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify routing and termination locations of duct bank prior to excavation for rough-in.
- B. Verify locations of manholes prior to excavating for installation.
- C. Duct bank routing is shown in approximate locations unless dimensions are indicated. Route as required to complete duct system.
- D. Manhole locations are shown in approximate locations unless dimensions are indicated. Locate as required to complete ductbank system.

### **3.02 DUCT BANK INSTALLATION**

- A. Install duct with minimum slope of 4 inches per 100 feet (0.33 percent). Slope duct away from building entrances.
- B. Cut duct square using saw or pipe cutter; de-burr cut ends.
- C. Insert duct to shoulder of fittings; fasten securely.
- D. Join nonmetallic duct using adhesive as recommended by manufacturer.
- E. Wipe nonmetallic duct dry and clean before joining. Apply full even coat of adhesive to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- F. Install no more than equivalent of three 90-degree bends between pull points.
- G. Provide suitable fittings to accommodate expansion and deflection where required.
- H. Stagger duct joints vertically in concrete encasement 6 inches minimum.
- I. Use suitable separators and chairs installed not greater than 4 feet on centers.
- J. Band ducts together before backfilling.
- K. Securely anchor duct to prevent movement during concrete placement.
- L. Provide suitable pull string in each empty duct except sleeves and nipples.
- M. Swab duct. Use suitable caps to protect installed duct against entrance of dirt and moisture.

### **3.03 EARTHWORK**

- A. Excavation and Backfill: Comply with Section 31 20 00 "Earth Moving", but do not use heavy duty, hydraulic operated, compaction equipment.
- B. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling completed.
- C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 32 92 00 "Turf and Grasses" and Section 32 93 00 "Plants".
- D. Cut and patch existing pavement in the path of underground ducts and utility structures according to the "Cutting and Patching" Article in Section 01 73 00 "Execution".

### **3.04 DUCT INSTALLATION**

- A. Install ducts according to NEMA TCB 2.
- B. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.
- C. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep GRC bends with a minimum radius of 48 inches (1220 mm) [12.5 feet (4 m)] [25 feet (7.5 m)], both horizontally and vertically, at other locations, unless otherwise indicated.
- D. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.
- E. Installation Adjacent to High-Temperature Steam Lines: Where duct banks are installed parallel to underground steam lines, perform calculations showing the duct bank will not be subject to environmental temperatures above 40 deg. C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct bank crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.
- F. Duct Entrances to Manholes and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches (250 mm) O.C. for 5-inch (125-mm) ducts, and vary proportionately for other duct sizes.
  - 1. Begin change from regular spacing to end-bell spacing 10 feet (3 m) from the end bell without reducing duct line slope and without forming a trap in the line.
  - 2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight line direct-buried duct banks with calculated expansion of more than 3/4 inch (19mm)
  - 3. Grout end bells into structure walls from both sides to provide watertight entrances.
- G. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet (3 m) outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls using galvanized steel sleeves. At floor and exterior wall conduit penetrations, completely seal the gap around conduit to render it watertight using "Link-Seal ®" products modular seal assemblies.
- H. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.
- I. Pulling Cord: Install 1 00-lbf- (445-N-) test nylon cord in empty ducts.
- J. Concrete-Encased Ducts: Support ducts on duct separators.

1. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes less than 6 inches (150 mm) in nominal diameter.
2. Width: Excavate trench 12 inches (300 mm) wider than duct bank on each side.
3. Width: Excavate trench 3 inches (75 min) wider than duct bank on each side.
4. Depth: Install top of duct bank at least 24 inches (600 mm) below finished grade in areas not subject to deliberate traffic, and at least 30 inches (750 min) below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
5. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
6. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than [four] [five] spacers per 20 feet (6 in) of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches (150 mm) between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
7. Minimum Space between Ducts: 3 inches (75 mm) between ducts and exterior envelope wall, 2 inches (50 mm) between ducts for like services, and 4 inches (100 mm) between power and signal ducts.
8. Elbows: Use manufactured duct elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run unless otherwise indicated. Extend concrete encasement throughout length of elbow.
9. Elbows: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.
  - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
  - b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of base. Install insulated grounding bushings on terminations at equipment.
10. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
11. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
12. Concrete Cover: Install a minimum of 3 inches (75 mm) of concrete cover at top and bottom, and a minimum of 2 inches (50 mm) on each side of duct bank.
13. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
  - a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.
  - b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch (15-mm) reinforcing-rod dowels extending a minimum of 18 inches (450 mm) into concrete on both sides of joint near corners of envelope.
14. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 033000 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.

K. Direct-Buried Duct Banks:

**Added per Addendum #1 on April 7, 2025**

1. Excavate trench bottom to provide firm and uniform support for duct bank. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inches (150 mm) in nominal diameter.
2. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
3. Space separators close enough to prevent sagging and deforming of ducts, with not less than [four] [five] spacers per 20 feet (6 in) of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches (150 min) between tiers.
4. Depth: Install top of duct bank at least 36 inches (900 ion) below finished grade unless otherwise indicated.
5. Set elevation of bottom of duct bank below frost line.
6. Install ducts with a minimum of 3 inches (75 ion) between ducts for like services and 6 inches ( 1 50 mm) between power and signal ducts.
7. Elbows: Install manufactured duct elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
8. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.
  - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 min) of concrete.
  - b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 min) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
9. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches ( 1 00 rum) over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 312000 "Earth Moving" for installation of backfill materials.
  - a. Place minimum 3 inches (75 mm) of sand as a bed for duct bank. Place sand to a minimum of 6 inches (150 torn) above top level of duct bank.
  - b. Place minimum 6 inches (l 50 miv) of engineered fill above concrete encasement of duct bank.
- L. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried ducts and duct banks, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of duct bank. Provide an additional plank for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 rum). Space additional planks 12 inches (300 mm) apart, horizontally.
- M. Warning Tape: Bury warning tape approximately 12 inches (300 mm) above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches (75 miv) of centerline of duct bank. Provide an additional warning tape for each 12-inch (300-inn) increment of duct-bank width over a nominal 1 8 inches (450 mm). Space additional tapes 12 inches (300 mm) apart, horizontally.

**3.05 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE**

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by manufacturer.

**Added per Addendum #1 on April 7, 2025**

- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
- D. Install handholes and boxes with bottom below frost line, <Insert depth of frost line below grade at Project sited below grade.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.
- F. Field cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
- G. For enclosures installed in [asphalt paving] [and] <Insert material> and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.
  - 1. Concrete: 3000 psi (20 kPa), 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with a troweled finish.
  - 2. Dimensions: [10 inches wide by 12 inches deep (250 mm wide by 300 mm deep).

### **3.06 GROUNDING**

- A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

### **3.07 FIELD QUALITY CONTROL**

- A. Perform the following tests and inspections and prepare test reports:
  - 1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
  - 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 6-incl- (1 50- min-) long mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
  - 3. Test manhole[ and handhole] grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Correct deficiencies and retest as specified above to demonstrate compliance.

### **3.08 CLEANING**

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes, including sump. Remove foreign material.

**END OF SECTION**

## SUBSTITUTION REQUEST

(During the Bidding/Negotiating Stage)

|          |                                                                                    |                              |                                                                |
|----------|------------------------------------------------------------------------------------|------------------------------|----------------------------------------------------------------|
| Project: | <u>Bethany Beach Training Site Track Resurfacing and Lighting</u>                  | Substitution Request Number: | <u>Spec-0062601</u>                                            |
|          | <u>Bethany Beach, DE</u>                                                           | From:                        | <u>Paulette Hogan, ICP Building Solutions Group</u>            |
| To:      | <u>Brittney M. Poore , Delaware Army National Guard - Joint Force Headquarters</u> | Date:                        | <u>03/19/2025</u>                                              |
|          | <u>brittney.m.poore.mil@army.mil, 3023267138</u>                                   | A/E Project Number:          | <u></u>                                                        |
| Re:      | <u>Synthetic Running Track Surfacing</u>                                           | Contract For:                | <u>Delaware Army National Guard - Joint Force Headquarters</u> |

Specification Title: Synthetic Running Track Surfacing Description: Synthetic Running Track Surfacing  
 Section: \_\_\_\_\_ Page: \_\_\_\_\_ Article/Paragraph: \_\_\_\_\_

|                        |                                     |               |                                              |                              |
|------------------------|-------------------------------------|---------------|----------------------------------------------|------------------------------|
| Proposed Substitution: | <u>Plexitrac Accelerator</u>        |               |                                              |                              |
| Manufacturer:          | <u>ICP Building Solutions Group</u> | Corporate HQ: | <u>150 Dascomb RD.<br/>Andover, MA 01810</u> | Phone: <u>(800) 225-1141</u> |
| Trade Name:            | Plexitrac Accelerator               |               |                                              | Model No.: N/A               |

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

**The Undersigned certifies:**

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.

Submitted by: Paulette Hogan

Signed by: Paulette Hogan

Firm: ICP Building Solutions Group

Address:

, MA

Telephone: , phogan@icpgroup.com

### A/E' s REVIEW AND ACTION

- ☐ Substitution approved - Make submittals in accordance with Specification Substitution Procedures.
- ☐ Substitution approved as noted - Make submittals in accordance with Specification Substitution Procedures.
- ☐ Substitution rejected - Use specified materials.
- ☐ Substitution Request received too late - Use specified materials.

**Signed by:**

Date:

Supporting Data  
Attached:

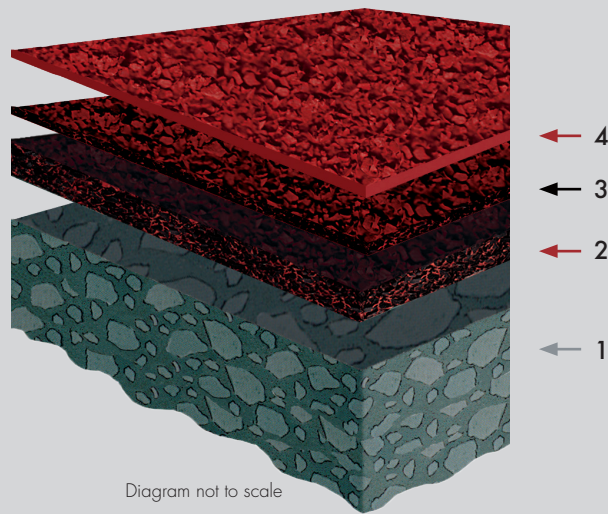
- ☐ Drawings    ☐ Product Data    ☐ Samples    ☐ Tests    ☐ Reports    ☐



## PLEXITRAC ACCELERATOR RUNNING TRACK

Accelerator provides the highest levels of performance for texture, longevity and athletic performance. Accelerator is an EPDM surface top coated with the Polyresin Plexitrac Coating, ensuring uniformity and years of UV light stable color.

1. Concrete or Asphalt
2. Plexitrac Binder with SBR Rubber Granules
3. Plexitrac Binder with EPDM Rubber Granules
4. Plexitrac Coating



- Premium acrylic sandwich system for top collegiate and high school running track facilities
- Meets International Association of Athletic Federation (IAAF) requirements for vertical deformation, force reduction, coefficient of friction, and elongation at break
- Full depth color binder & coating provides UV stability and enhances colors
- Composition may be eligible for LEED credits
- Five year manufacturers warranty is available through CSS authorized applicator



**MULTI-SPORT SURFACE SOLUTIONS FOR:**



TRACK



MULTI-PURPOSE

*Plexitrac*

*Plexitrac*



Top image:  
Archbishop McCarthy High School - Southwest Ranches, FL  
Installed by: Nidy Sports Construction



Bottom image:  
Citrus College - Los Angeles, CA  
Installed by: The Track Doctor



**CALIFORNIA®**  
SPORTS SURFACES

## OUR COMMITMENT TO QUALITY

Since 1953, California Sports Surfaces has provided customers with a premier offering of acrylic surface systems. Our products include DecoTurf, Plexipave, Rebound Ace, Plexitrac, Guardian Crack Repair, Premier Sports and Premier Sports Coatings. We provide the world with comfortable, high-performance cushioned surfaces for a variety of professional, collegiate and recreational sports as well as decorative projects, bike lanes, parking lots and more.

**United States:** 150 Dascomb Rd., Andover, MA 01810 • Phone 978.623.9980  
**Australia:** 30 – 32 Assembly Drive, Tullamarine, Victoria, Australia, 3043 • Phone 1800 786 617 (Toll Free) • In Australia: +61 3 9338 9851

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02.07.2020



## **PLEXITRAC® ACCELERATOR POLYRESIN TRACK SYSTEM**

### **1.0 DESCRIPTION**

This specification covers the installation of a new, high performance resilient track surfacing system for new asphalt or concrete surfaces. This polyresin track system utilizes specially compounded, pigmented water-based binders and select rubber granules to provide strength, flexibility and to prevent ultraviolet degradation. A topcoat is applied to further protect against harmful UV rays and to reduce wear. The system provides a durable, resilient, spike resistant surface for recreational and competitive use.

NOTE: The success of the running track surface is dependent on a sound base (with good drainage) and the asphalt or concrete meeting the requirements of The National Asphalt Paving Association and the American Sport Builders Association. Variations of the existing subsurface should not exceed 1/4" in 10' (3mm in 3m) when measured in any direction with a straightedge.

**2.0 MATERIALS** – All liquid products shall be supplied by one manufacturer.

- 2.1 Court Patch Binder**
- 2.2 8425 ICP Tack Coat**– Latex emulsion tack coat.
- 2.3 Water** – The water used in all mixtures shall be fresh and potable.
- 2.4 Plexitrac Binder**
- 2.5 Rubber Granules** – Select granules for job mixing with Plexitrac Binder.
- 2.6 Plexitrac Coating**
- 2.7 Plexitrac Pigment** – Water-borne pigment for enhanced color depth
- 2.8 Plexicolor Line Paint**

\*Other colors available upon request and the availability of appropriate EPDM granules.

### **3.0 SURFACE PREPARATION**

3.1 Prior to the application of surfacing materials, the entire surface should be flooded and checked for minor depressions or irregularities. Any puddled area covering a nickel shall be marked and repaired with Court Patch Binder according to CSS Specification. After patching, the asphalt surface shall not vary more than 1/4" in 10' measured in any direction.

### **4.0 CONSTRUCTION**

Allow all patching to dry thoroughly. The surface to be coated must be sound, smooth, and free from dust, dirt or oily materials.



4.1 **Primer Coat** – A tack coat of 8425 must be applied over the entire surface at a rate of .04 gal./sq. yd.

4.2 **Track surface** – Materials shall be applied to achieve a dense uniform surface of not less than the specified thickness in not less than 3 layers. The Plexitrac Binder must be evenly distributed amongst the rubber granules upon the application of materials. Coverage rates:

3/8”/9.5mm

| Color:           | Thickness:   | Rubber Granules:  | Plexitrac Binder (R/G/B): |
|------------------|--------------|-------------------|---------------------------|
| Black            | 2/8” (6.5mm) | 7.0 lbs./sq. yd.  | .40 gal./sq. yd.          |
| Red, Blue, Green | 1/8” (3.0mm) | 5.0 lbs./ sq. yd. | .24 gal./ sq. yd.         |

1/2”/12.5mm

| Color:           | Thickness:   | Rubber Granules:   | Plexitrac Binder (R/G/B): |
|------------------|--------------|--------------------|---------------------------|
| Black            | 3/8” (9.5mm) | 10.5 lbs./ sq. yd. | .60 gal./ sq. yd.         |
| Red, Blue, Green | 1/8” (3.0mm) | 5.0 lbs./ sq. yd.  | .24 gal./ sq. yd.         |

Coverage rate based on undiluted product. Binder to rubber ratio shall be 1-gallon Plexitrac Binder per 18 lbs. of Black SBR Rubber and 1 gallon of Plexitrac Binder to 21 lbs. of EPDM.

To further enhance color depth, it is recommended to add 3 gallons of Plexitrac Pigment to each 55-gallon drum of Plexitrac Binder on the final application of Plexitrac Binder spray coat. Plexitrac Pigment is a water-borne colorant available from California Sports Surfaces.

The coverage rate for the rubber granules is dependent on the specific gravity (density) of the rubber and the installation method of surfacing system. Different densities will affect the dry bulk value of the rubber, which determines the weight per square yard for a specified thickness. The specific gravity for rubber particles can vary between colors, size, and manufacturers. It is recommended to consult the manufacturer for more information. Different application methods can affect the overall system density requiring lower or higher volumes of product. System weights and volumes shall be verified by on-site sample methods.

4.3 **Topcoat:** Plexitrac Coating shall be applied by approved spray equipment at a rate of not less than .10 gallons per square yard.

4.4 **Line striping** – Plexicolor line paint shall be applied to meet all rules and regulations of the local track federation.



## 5.0 LIMITATIONS

- No part of the construction shall be conducted during rainfall or when rain is imminent
- Allow 4-5 hours to cure at 70F. Lower temperature and higher humidity will increase the dry time
- Apply only when ambient and surface temperature is 55°F/13°C and below 130°F/55°C.
- Keep from freezing. Do not store in direct sunlight
- The Polyresin Track system will not prevent pavement cracks from occurring
- Allow applications to thoroughly cure prior to subsequent applications
- Take appropriate precautions to prevent overspray and mask adjacent areas when necessary.
- Allow new asphalt surface to cure for a minimum of 14 days
- Allow new concrete surface to cure no less than 28 days

## 6.0 PHYSICAL PROPERTIES

**6.1 Plexitrac Binder** is a high-solids pigmented binder containing specific fibers to promote strength.

Viscosity 90-95 ku      Pigment and Filler >6% total formula

**6.2 Plexitrac Coating** is a fully pigmented acrylic topcoat system designed to reduce ultraviolet degradation. It is made from SBR resins specifically designed for track surfaces to provide a strong, long lasting surface that can withstand the elements. It should be applied in two (2) alternating coats at a coverage rate of .05 gal./sq. yd. per coat. One application shall be applied clockwise, the other counterclockwise.

**6.3 Rubber Properties:** 1-3mm Sieve Analysis – Rubber supply can vary. Check compatibility with California Sports Surfaces.

| Mesh | M.M. | % Retained | Specific Gravity:                       |
|------|------|------------|-----------------------------------------|
| 6    | 3.36 | 0-15%      | Black Rubber Granules: 1.15-1.40        |
| 10   | 2.00 | 60-85%     | Colored EPDM Rubber Granules: 1.40-1.60 |
| 18   | 1.0  | 10-30%     |                                         |
| PAN  | 1.0  | 0-5%       | Hardness: Shore A, 55-75 durometer      |

**7.0 DISCLAIMER:** Suggestions for use of our product or inclusion of descriptive material from patents should not be understood as recommending the use of our product in violation of any patents.



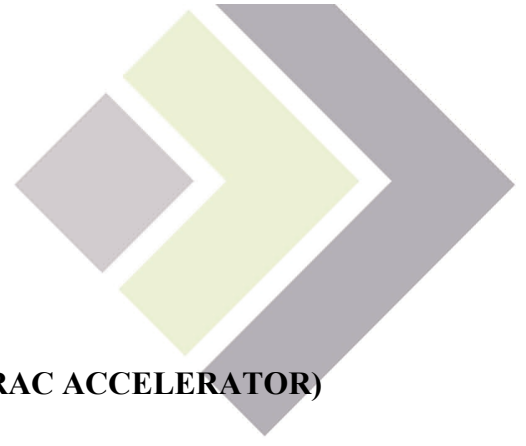
8.0 **GENERAL:** Materials must be specifically designed for the construction of running track surfaces. Materials specified shall be delivered to the site in sealed, properly labeled drums with current California Sports Surfaces labels that are stenciled with the proper batch code numbers. Products packaged or labeled in any other manner will not be accepted. Minimal addition of clear, fresh potable water at the job site is dependent on temperature and material flow. Coverage rates are based upon undiluted material. Dispose of empty containers in accordance with local, state and federal regulations.

| Performance Comparison       |                                                                 |  |                                |                       |                                    |
|------------------------------|-----------------------------------------------------------------|--|--------------------------------|-----------------------|------------------------------------|
|                              |                                                                 |  | Plexitrac<br>(Premium Acrylic) | Sandwich<br>System #1 | Basemat Structural<br>Spray System |
| Test                         | World<br>Athletics<br>Standard                                  |  | Accelerator (13mm)             | 13mm                  | 13mm                               |
| Vertical Deformation         | .6 to 2.5 mm                                                    |  | 2.3                            | .6 to 2.5mm           | 2.0mm                              |
| Force Reduction              | 35% to 50%                                                      |  | 41%                            | 35% to 50%            | 39%                                |
| Coefficient of Friction      | >/.50wet                                                        |  | >.56                           | >/0.50                | .55                                |
| Elongation at Break          | >40%                                                            |  | 54%                            | >40%                  | 59%                                |
| EPDM Wear Layer<br>Thickness | <div> <div>3-5mm</div> <div>3-5mm</div> <div>1-3mm</div> </div> |  |                                |                       |                                    |

# Life Cycle Cost Analysis

|                                            | Year 0           | Year 5                           | Years 5 - 7         | Years 12 - 15                           | Years 16 - 20    | 20 year life cycle | Cost per year   |
|--------------------------------------------|------------------|----------------------------------|---------------------|-----------------------------------------|------------------|--------------------|-----------------|
| 54,000 Square Feet                         | Cost to install  | Cost to Restripe                 | Routine Maintenance | Cost to Resurface or Remove and Replace | Cost to Restripe |                    |                 |
| Full Pour Polyurethane @13mm               | \$592,000        | \$7,500                          | \$100,000           | \$252,000                               | \$7,500          | <b>\$959,000</b>   | <b>\$47,950</b> |
| Polyurethane Sandwich System@13mm          | \$408,000        | \$7,500                          | \$100,000           | \$252,000                               | \$7,500          | <b>\$775,000</b>   | <b>\$38,750</b> |
| Base mat with Structural Spray System@13mm | \$180,000        | \$7,500                          | \$100,000           | \$175,000                               | \$7,500          | <b>\$470,000</b>   | <b>\$23,500</b> |
| <b>Accelerator @13mm</b>                   | <b>\$180,000</b> | <b>Included with Maintenance</b> | <b>\$39,000</b>     | <b>\$90,000</b>                         | <b>\$7,500</b>   | <b>\$316,500</b>   | <b>\$15,825</b> |

Costs reflect national averages for labor and materials. Please review final costs with your CSS authorized applicator.



**32 18 23.39**

**RUNNING TRACK RESILIENT SURFACING (PLEXITRAC ACCELERATOR)**

**PART 1 GENERAL**

**1.1 DESCRIPTION**

Furnish and install Plexitrac® Accelerator Running Track resilient surfacing as manufactured by California Sports Surfaces on the accepted asphalt pavement.

NOTE: Color selection required by owner/designer

**1.2 RELATED SECTIONS**

**A. Related work**

- Drainage (sec 33 41 00)
- Aggregate Base (sec 32 11 23)
- Asphalt Pavement (sec 32 12 16)
- Athletic Equipment (sec 11 68 33)

**B. References**

1. National Asphalt Pavement Association (NAPA)
2. USA Track & Field (USATF)
3. National Federation of State High School Associations (NFHS)
4. National Interscholastic Athletic Administrators Association (NIAAA)
5. World Athletics (formerly known as International Association of Athletics Federation)
6. American Sports Builders Association (ASBA)
7. American Society for Testing & Materials (ASTM)

**1.3 QUALITY ASSURANCE**

- A. Asphalt surface shall comply with the guidelines of the ASBA and NAPA for surface planarity and density.
- B. All liquid materials shall be from a single source and manufactured for the purpose of resilient track construction.
- C. The contractor shall record the batch number of each product used on the site and maintain it throughout the warranty period.
- D. The contractor shall provide the owner, an estimate of the volume of each liquid product and the weight of the rubber granule to be used on site.
- E. The installer shall be an Authorized Applicator of the specified surface system.
- F. The manufacturer's representative will be available to help resolve material issues.



#### 1.4 SUBMITTALS

- A. Manufacturer's specifications for components and system.
- B. Representative sample of the system to be installed with appropriate labeling for identification.
- C. Current safety data sheets (SDS) for the liquid components.
- D. Current Authorized Applicator certificate from the surface system manufacturer.
- E. A certificate from the manufacturer of the binders and coatings stating that the materials have been produced specifically for the use in sports surfacing construction.
- F. A complete list of materials intended to be used in the construction of the running track system. All liquid quantities will be prior to dilution.
- G. A test report that the 12mm/1/2" system has been tested to World Athletics and ASTM standards for force reduction, modified vertical deformation, coefficient of friction (wet) and elongation at break for permeable systems. Force reduction shall be 35-50% (ASTM F 2157). Modified vertical deformation shall be 0.6-2.5 mm (ASTM F 2157). Coefficient of friction shall be greater than .5/wet (ASTM F 2157). Elongation at break shall be greater than 40% (ASTM D 412).
- H. Reference list from the installer of at least 5 projects of similar scope done the past three years.
- I. Product substitution: If other than the product specified, the contractor shall submit at least 7 days prior to the bid date a complete type written list of proposed substitutions with sufficient data, drawings, samples and literature to demonstrate that the proposed substitution is of equal quality and utility to that originally specified. Information must include a QUV test of at least 1,000 hours and World Athletics test information for the system to be installed.

#### 1.5 MATERIAL HANDLING AND STORAGE

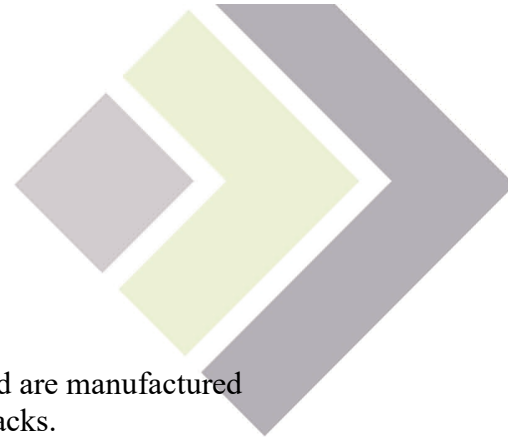
- A. Store material in accordance with manufacturer's specifications and SDS.
- B. Deliver products to the site in original, unopened containers with labels attached.
- C. All surfacing materials shall be non-flammable.

#### 1.6 GUARANTEE

- A. The installer and the materials manufacturer shall supply a warranty covering labor and materials respectively. The warranty period shall be for five (5) years.

#### 1.7 INSTALLER QUALIFICATIONS

- A. Installers shall be regularly engaged in the construction and surfacing of running tracks.
- B. Installer shall be an authorized applicator of the specified system.
- C. Installer shall be a builder member of the ASBA.



## 1.8 MANUFACTURER QUALIFICATION

- A. Material supplier shall certify that the materials provided are manufactured specifically for construction and surfacing of running tracks.
- B. System manufacturer shall be a US owned company that has been continuously engaged in the business of track surfacing materials for at least 10 years.
- C. Manufacturer shall be a member of the ASBA.
- D. System manufacturer shall have a designated representative available for site inspection.

## PART 2 PRODUCT

### 2.1 MANUFACTURER

- A. Manufacturer – California Sports Surfaces, Andover, MA  
[www.californiasportssurfaces.com](http://www.californiasportssurfaces.com)
- B. Any materials used must be an emulsion/water-based product. Any products which require solvents such as MEK, Butyl Cellusolve or Acetone for clean up or mixing are not acceptable.
- C. Materials must have a VOC less than 150g/lit. for binder products. Topcoats shall have a VOC of less than 100g/lit. measured by EPA method 24.
- D. Materials may not have a flash point of less than 200°F.

### 2.2 MATERIALS

- Court Patch Binder- 100% Acrylic resin blended with Portland Cement and Silica Sand
- 8425 ICP Tack Coat- Latex emulsion Primer. SBR emulsion
- Plexitrac Binder- High Viscosity Polyresin Blend
- Plexitrac Pigment- Water-borne dispersed pigment for enhanced color
- Plexitrac Coating- Highly Pigmented Polyresin Top Coat
- California Line Paint- 100% Acrylic Resin containing no alkyds or vinyl co-polymer constituents
- Rubber Granules- Specifically gradated 1-3MM SBR and/or EPDM particles for job mixing with the Plexitrac Binder
- Water- The water to be used in the mixture must be fresh and potable

The installer will provide to the Owner/Architect a proforma materials list prior to the installation of the volume of materials to be used on the project. The proforma will include the following:

- a) Surface area to receive the surfacing system \_\_\_\_\_ square yards
- b) Specified thickness 1/2" in.
- c) Pounds of Rubber 10.5 lb. sq./y SBR 5.0 lb. sq./y Colored EPDM
- d) Gallons of 8425 (Undiluted) .04 gal/sq./y



- e) Gallons of Colored Plexitrac Binder (Undiluted) 1 gal. per 18 lbs. SBR / 1 gal. per 21 lbs. EPDM Minimum
- f) Gallons of Plexitrac Pigment (Final Binder Application) 3 gal. per 55 gal. Binder
- g) Gallons of Colored Plexitrac Coating (Undiluted) .1 gal. / sq./y

The installer will furnish the Owner/Architect with a proof of delivery that the correct volume of product has been provided. The installer will also verify that the same manufacturer has supplied all binders and coatings.

### PART 3 EXECUTION

#### 3.1 WEATHER LIMITATIONS

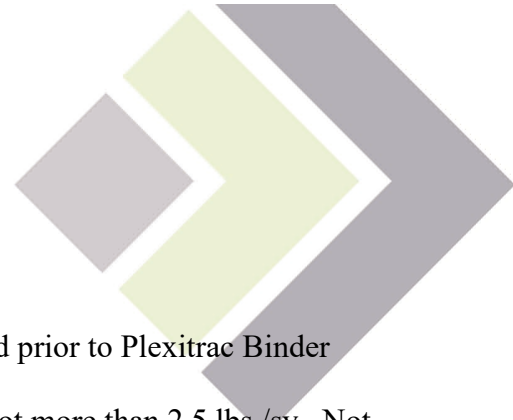
- A. Ambient and surface temperatures must be 55°F/13°C and rising.
- B. Installation should not be conducted during rainfall or when rainfall is imminent.
- C. Do not apply when surface temperature is in excess of 130°F/55°C.

#### 3.2 SURFACE PREPARATION

- A. New asphalt shall be allowed to cure for a minimum of 14 days prior to the application of any surfacing materials. New concrete shall be allowed to cure for a minimum of 28 days prior to application of any surfacing materials.
- B. The surface must be thoroughly cleaned of all loose dirt and debris.
- C. Prior to the application of resilient surface materials, the entire surface shall be flooded and checked for depressions or irregularities in the asphalt. Any puddle area covering a nickel shall be marked and repaired with Court Patch Binder, according to California Sports Surfaces Specification 10.14. After patching, the asphalt surface shall not vary more than 1/4" in 10 feet, measured in any direction. Any depressions 1/4" or greater, shall be leveled using patch materials indicated. Slopes shall meet the guidelines of the ASBA and NFHS/NCAA/World Athletics

#### 3.3 RESILIENT SURFACE INSTALLATION

- A. After curing and preparation, the asphalt shall be primed/tack coated with 8425 at the rate of .04 gal/sy. by means of a dual diaphragm pump and spray unit. Do not allow material to puddle on the asphalt surface.
- B. Apply dry 1-3 MM Black SBR to the tack coated surface by mechanical spreader or by hand. Avoid leaving dry rubber granules more than one layer thick.
- C. Apply Plexitrac Binder at the rate of one gallon per 18 lbs. of Black SBR granule by means of a dual diaphragm pump and spray unit. Care should be taken to uniformly spray the granules, so they are fully encapsulated. Add 3 gallons of Plexitrac Pigment per 55 gallons of Plexitrac Binder when laying final application.
- D. Apply additional layers of Black SBR granule and Plexitrac Binder until the specified thickness and weight of Black rubber has been applied. Each dry layer should be raked by hand to insure uniformity of thickness and density. In no case



should a rubber layer be greater than 2.5 lbs./square yard prior to Plexitrac Binder Application.

- E. Apply dry 1-3 MM Colored EPDM granule at the rate not more than 2.5 lbs./sy. Not less than two layers shall be applied.
- F. Apply Plexitrac Binder at the rate of one gallon for 21 lbs. of 1-3 MM Colored EPDM granule. Plexitrac pigment shall be added to Plexitrac Binder for added UV stability.
- G. Prior to application of Plexitrac Coating and line marking, the surface shall be tested for the required depth using SMG FT-3 Floor Tester depth gauge. The running track oval shall be tested in no less than 100 locations. The tests shall be performed at the center of both the outer and inner lane, as well as, the center of the oval. At least 80% of the readings must meet the required depth, if not, additional layers of rubber and binder will be applied until the proper depth has been achieved.
- H. Apply Plexitrac Coating at the total rate of .1 gallon per square yard. Product shall be applied in two applications by a dual diaphragm pump spray unit. One application shall be applied clockwise, the other counterclockwise.

### 3.4 MARKING AND MEASUREMENTS

- A. Wait 48 hours after surface completion before applying line marking. The installer shall:
  - a) Locate and establish all radius points.
  - b) Establish and set all necessary control points.
  - c) Layout all lines and markings to tolerances set forth by ASBA and governing body requirements.
  - d) Prepare all necessary drawings.
  - e) Provide all computations and measurements in organized form.
  - f) Establish all locations on the curves using a Transit or Theodolite capable of reading direct to 20 seconds.
  - g) Identify all markings, where appropriate, by painting the identification directly onto the track surface in 4" letters just below or in front of each mark in the right-hand portion of the lane.
  - h) Paint all of the large, 3' high, lane numbers in two (2) colors, utilizing shadowed backgrounds.
  - i) All lines shall receive sufficient paint to assure complete opacity and uniformity of color.
  - j) Paints shall be used directly from original containers and shall be thinned only when hot temperatures dictate thinning for smooth applications.
  - k) Amount of paint used shall be as recommended by the manufacturer.
  - l) The paint used shall be a 100% acrylic latex line paint, Plexicolor Line paint, made especially for the painting of lines on sports surfaces
  - m) All measurements shall be made by competent, experienced and fully qualified personnel.



- n) Upon completion of the track markings, a licensed professional engineer or registered land surveyor shall furnish an acceptable letter of or certificate of, accuracy to the Owner attesting to the accuracy of the track markings and measurements. This will also include copies of the computations, calculations and drawings that were used to obtain this accuracy. The Engineer or Surveyor should affix their stamp to the drawing and the certificate.
- o) The markings shall include all events and marks required or recommended by the National Federation of State High Schools, the NCAA, or World Athletics dependent on the end use of the facility.

### 3.5 PROTECTION

- A. During construction, the owner is responsible for limiting access of non-construction personnel to the site.
- B. The owner shall coordinate any irrigation of fields with the installation contractor.
- C. The installer shall protect curbs, fences and other structures from overspray.

### 3.6 CLEAN UP

- A. Remove all containers, surplus and debris and dispose of in accordance with local, state and Federal regulation.
- B. Remove all spills and overruns.
- C. Leave site in a clean and orderly condition.



International Association of Athletics Federations

Mr A. F. Tucker  
Vice President Recreational Products  
California Products Corporation  
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ANDOVER, MA 01810  
USA

Monaco, 16 March 2006

Dear Mr Tucker

I refer to your discussions in Canberra, Australia with Mr Denis Wilson, Honorary Technical Adviser IAAF Technical Committee, in January 2006 about acceptance by the IAAF of latex based synthetic surfaces and in particular your Plexitrac Accelerator.

It is acknowledged by the IAAF that Plexitrac Accelerator meets the force reduction, vertical deformation and friction requirements of the IAAF Performance Specifications for synthetic surfaces. However, Plexitrac Accelerator tensile properties are slightly less than the minimum limits set in the performance specifications for porous synthetic surfaces.

The IAAF Technical Committee at its recent meeting determined not to change those limits or to have a separate category for latex bound synthetic surface tracks. Therefore it is not possible for Plexitrac Accelerator at present to receive an IAAF Product certificate. However, it is quite acceptable for Plexitrac Accelerator to be used on tracks for national competition and training. Any records and performances made on tracks surfaced with Plexitrac Accelerator would be recognised by the IAAF provided all the requirements of the IAAF are met as regard to the measurement of the facility and the conduct of the competition.

I wish you well in your track surfacing business.

Yours sincerely

Imre Matrahazi  
IAAF Technical Manager

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